INDIGENOUS

AGRICULTURAL IMPLEMENTS

OF INDIA

AN ALL-INDIA SURVEY

136

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FOREWORD

Production whether agricultural or industrial depends on the application of power to materials, and this power may be human, animal, mechanical or electrical. Natural resources become useful only when they have been made available by the application of power and intelligence.

Tools, implements and machines are means of applying power to materials, and the production of a worker is controlled by the extent to which these are used. In Western countries, the application of engineering to agricultural production has proceeded far but in India it has barely begun. Such an application to Indian agriculture holds greater potentialities than any other single line of improvement for increasing agricultural production. While mechanisation of Indian agriculture would be an application of engineering, it is by no means the only or necessarily the most important phase. Wherever it fits in, there should be no prejudice against its adoption. The main place, however, should be given for improving the implements and appliances which can be used by farmers now actually doing cultivation. The development of a better Khurpi or a better Bakhar or the use of better materials of construction and better methods of fabrication would equally be an application of engineering knowledge and practice to Indian agriculture. Research should, therefore, be directed more towards developing implements which can be advantageously used on farms approximating the now available ones than to the bigger cultivators in the region. The power for working the implements should not require a very heavy pair of animals, as this creates a wrong impression in the minds of farmers. The use of multiple pairs of work animals for working the heavy implements is already practised by farmers in some parts. This may perhaps be followed up for the operation of the bigger ploughs and accessories.

Agricultural revolution in the Western countries really began with the improvements in the methods and equipments for harvesting, which is the operation that creates the biggest demand on seasonal labour both for *kharif* and *rabi* crops. Improved methods of threshing, winnowing and grain dressing should give a sizeable increase in the income of the farmer. A reduction in the time of harvesting and threshing operations will give increased time for dry weather ploughing and other field operations.

A rich field for investigation lies in the subject of efficient water lifts to raise water from canals. There are various possibilities of employing bullocks for rotary power. There is also need for the development of bullock carts for improving market transport facilities and farm produce movements.

Yet another item that has not been attempted seriously is a survey of the building needs of farmers both for their own houses and for housing the animals and equipment. This is an important item that is essential for improving rural life and raising the living level among the village folk.

Small-scale dairy appliances for home butter and ghee production is still another side which has not been attempted earnestly and this would go a long way in furthering the development of diversified farming among cultivators. Simple and efficient means of transport for moving milk and milk products to the cities is also another interesting subject requiring careful study for improvements

The aforesaid items would tend to indicate that what has been attempted so far by the I.C.A.R. with the co-operation of the States in this report is just a small beginning of the huge task that agricultural engineers have yet to solve. It is, however, a happy augury that the Planning Commission have also begun to show greater interest in the development of farm implements and machinery and this will go a long way in helping the I.C.A.R. in its efforts to improve the standards and variety of agricultural implements used by the average Indian farmer.

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SECTION I

GENERAL

CHAPTER I

INTRODUCTION

In the First Five-Year Plan, under the various schemes pertaining to agriculture, the Planning Commission had recommended establishment in every State of a separate section with adequate facilities for whole time research on indigenous implements and tools. In view of the rising rates of farm labour and the pressing need to increase the production of food and other crops the subject of research, improvements, introduction and popularisation of improved implements has been under active consideration of the Union Ministry of Food and Agriculture for the last few years.

Under the Second Five-Year Plan, the Planning Commission has again emphasized that Agriculture Departments in the States should devote more attention to the study of the evolution of suitable types o, improved farm implements and machinery. It was, therefore, considered that the importance of this aspect of agricultural engineering research should be discussed by a meeting of the Agricultural Engineers of the States. Therefore, the I.C.A.R. convened a conference on agricultural implements and machinery in January, 1953.

This conference recommended to the Indian Council of Agricultural Research that a survey of indigenous agricultural implements in vogue in the country be conducted to provide basic data for carrying out research and improvements in them. This survey on all-India basis became all the more necessary in view of very scanty information about the design, construction, output, power requirements and general performance of the several types of indigenous implements commonly used in the various parts of the country. From academic and fundamental considerations as well such a survey was considered desirable.

In pursuance of the above recommendations the I.C.A.R. sanctioned in 1954 a scheme for the survey of indigenous agricultural implements throughout the country. Due to non-availability of qualified and experienced staff, the implementation of this survey work was undertaken by most of the States only from 1955 or even later. To ensure uniformity in the collection and compilation of the necessary data, a detailed proforma in respect of each type of implement was prescribed by the I.C.A.R.

The members of the staff in the States were required to submit

the data and general information based on their field investigations to the I.A.R.I. for preparing a consolidated All-India Report.

The task of formulating a suitable pattern for the consolidated All-India Report and its compilation was entrusted to a main committee and four sub-committees appointed by the I.C.A.R. Many of the States were able to complete this survey only by about the middle of 1957. The Survey reports from the several States were however received at the I.A.R.I. in complete form by the end of that year.

The main committee and the sub-committees held a series of meetings for the compilation of the report on an All-India basis and the finalised version was completed only by the end of 1958.

This report forms the first part of the Survey on Indigenous Farm Implements in common use in the various States of the country. The second stage of surveying the other remaining items of farm machines such as cane-crushers, chaff cutters, paddy hullers, threshing machines, decorticators, water lifts, etc. has also been recently sanctioned by the I.C.A.R. and the required proforma for furnishing the data has been got ready. The field work in the various States with reference to these items not covered by the first survey will be undertaken almost immediately.

Several recommendations of a useful nature are made at the end of the report and these have all been fully endorsed by Agricultural Engineering Committee for implementation both by the I.C.A.R. and the States at its meeting held on the 27th February, 1959.

CHAPTER II

PLAN OF THE PROJECT

The question of improvement of the agricultural implements in this country was examined in great detail by the Planning Commission during the First Plan Period. One of its major recommendations was to effect improvements in the indigenous agricultural implements with a view to increase their utility and efficiency.

In pursuance of the above recommendation and with the object of collecting the basic material for research in agricultural implements, the Indian Council of Agricultural Research initiated in 1954 a scheme to conduct a country-wide survey of the indigenous agricultural implements used in India.

The survey work was intended to be completed within two years time. As it was considered necessary that every participating State should have an uniform procedure for collecting the data, the Head of the Agricultural Engineering Division of the Indian Agricultural Research Institute, New Delhi, was requested to draft the necessary procedure and proformas for the following classes of indigenous implements.

(i) Ploughs
(ii) Harrows
(iii) Cultivators
(iv) Clod Crushers
(v) Seed Drills
(vi) Hoes
(vii) Ridgers
(viii) Harvesting Implements

The following States participated in the survey scheme :

States	*Date of starting*
Andhra	1- 4-1955
Assam	13- 8-1954
Bhopal	1- 8-1954
Bihar	1- 4-1954
Bombay	1- 4-1955
Coorg	1- 8-1954
Himachal Pradesh	—
Hyderabad	5-10-1954
Madhya Bharat	19- 6-1954

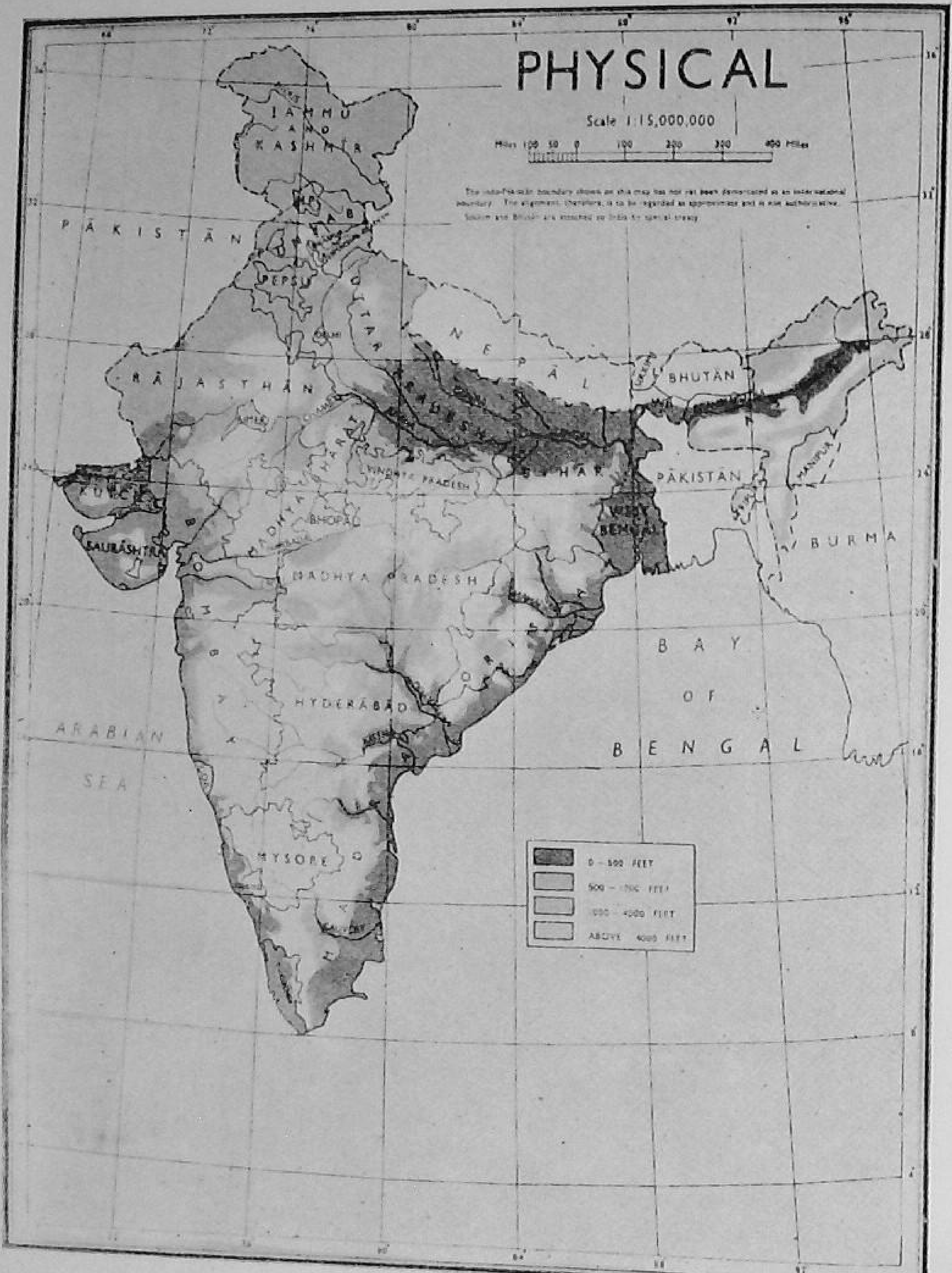


Fig. 1. Physical Map of India

Madhya Pradesh	10- 9-1954
Madras	22- 4-1954
Mysore	1- 7-1955
Orissa	9-12-1954
Pepsu	1-12-1954
Punjab	2- 6-1955
Rajasthan	16- 4-1955
Travancore-Cochin	20-12-1954
Uttar Pradesh	27-11-1954
Vindhya Pradesh	1-12-1954
West Bengal	10- 9-1954

The Head of the Division of Agricultural Engineering, I.A.R.I., was required to co-ordinate the results of the surveys undertaken in the various States. Survey reports were received from the States on the dates indicated against them in the following statement.

State	*Date of receipt of report at I.A.R.I.*
Andhra	24-10-1957
Assam	13- 8-1956
Bhopal	27-10-1956
Bihar	3- 4-1956
Bombay	3- 8-1957
Coorg	—
Himachal Pradesh	23-10-1956
Hyderabad	26- 9-1956
Madhya Bharat	4-11-1956
Madhya Pradesh	14- 2-1957
Madras	11- 3-1957
Mysore	23- 5-1957
Orissa	10- 7-1957
Pepsu	4-11-1956
Punjab	13- 8-1956
Rajasthan	7- 1-1957
Travancore-Cochin	24- 4-1956
Uttar Pradesh	7- 6-1957
Vindhya Pradesh	—
West Bengal	21- 2-1957

A committee consisting of Prof. Mason Vaugh, Shri D.A. Gadkary, Shri M.U. S. Jung, Shri F.C. Fenton, Shri R.V. Ramiah, Shri J.S. Manku, Shri A.C. Pandya, Shri S.K. Pal, Shri J.R. Badola and Shri C.S. Iyer reviewed the reports from the States on the 1st March, 1957 and made the following recommendations :

1. The All-India Report should be generally on the pattern of the report entitled "A preliminary study of farm implements used in Taiwan Province" published by the Chinese-American Joint Commission on Rural Reconstruction.
2. The information received should be classified implement-wise and State-wise.
3. A uniform terminology should be evolved.

The Committee also recommended for the evaluation, scrutiny and compilation of the large mass of data required, formation of the following Sub-committees :

(i) Terminology Sub-Committee
(ii) Ploughs Sub-Committee
(iii) Harrows and Hoes Sub-Committee
(iv) Seed Drills Sub-Committee
(v) Rollers, Ridgers and Harvesting Implements Sub-Committee.

The personnel of the Main and Sub-Committees and Project Staff are given on page 5.

After receipt of the reports form the Sub-Committees a meeting of the Chairmen of the Sub-Committees was held at Coimbatore from February 12th to 16th February 1958, to scrutinise the draft reports and to make suitable changes to give them an All-India pattern.

The implements surveyed all over the country and their representative types are shown in tabular forms in the relevant sections that follow.

CHAPTER III

PHYSICAL FEATURES OF THE COUNTRY

The country comprises three distinct regions i.e. the mountainous zone of the Himalayas, Indo-Gangetic Plain and Southern Peninsula.

The mountain region or wall of the Himalayas extends over a distance of about 1500 miles with a varying width of 150 to 200 miles. This region contains some of the most fertile and beautiful valleys like Kashmir and Kulu. In the East between India and Burma and India and Pakistan, the ranges are much lower.

The Indo-Gangetic Plain is roughly 1500 miles long and 150 to 200 miles broad and is watered by snow-fed rivers mainly the Ganges and Jamuna and their tributaries. The soil of this region is mostly alluvial and forms the major part of the cultivated area. Some of the most important crops grown in this region are wheat, rice, sugar-cane, *jowar* and jute.

Peninsular India comprises the central plateau known as the Deccan bounded by the Vindhya and Satpura ranges in the north, the Western and Eastern Ghats in the west and east respectively. The main rivers flowing in this region are Narbada, Tapti, Mahanadi, Godavari, Krishna, Pennar, Kavery and Tambraparani. All these rivers are monsoon-fed and with the exception of Narbada and Tapti all of them flow into the Bay of Bengal towards the east.

Geological Structure. Geologically also, India consists of three distinct units *i.e.* (i) the Himalayan region, (ii) the alluvial region of the Indo-Gangetic Plain, and (iii) the peninsular region.

Soils. The soils of India fall into the following 5 major groups :

1. Indo-Gangetic alluvium
2. Black soils of the Deccan Plateau
3. The red soils of the South
4. The laterite soils in Assam, Bihar and coastal regions of the peninsula
5. Desert sandy soils

A detailed soil map is given on page 34.

Climate. Climate of India is essentially monsoon tropical and this description is valid notwithstanding the local variations such as the winter rains in the north-west, which are entirely subsidiary to the main summer rainfall region. The seasonal rhythm can

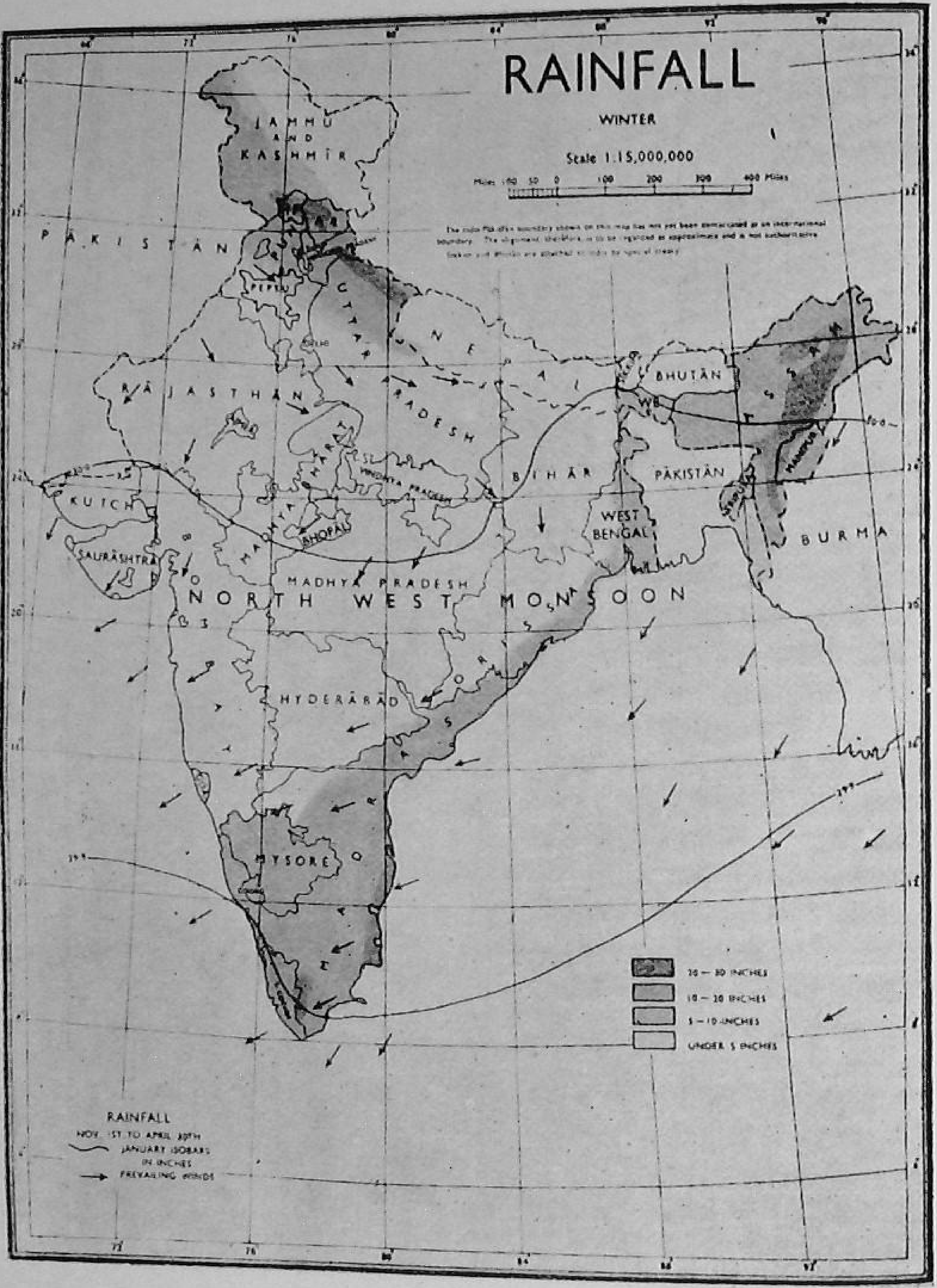


Fig 2. Map of India showing Rainfall in Winter

broadly be classified as follows :

1. Cold weather from October to the end of February.
2. Hot weather from the beginning of March to the beginning or middle of June.
3. Rainy season from the beginning or middle of June to the end of October.

The Indian Meteorological Department, however, recognises four seasons ; (i) Cold weather season (December–March), (ii) the hot weather season (April—May), (iii) the rainy season (June—September) and (iv) the season of the retreating south-west monsoon (October–November).

The south-west monsoon usually breaks about the beginning of June on the west coast and reaches elsewhere later. With the exception of the Madras coast, India receives the major share of its rainfall between June and September from the south-west monsoon. As it retreats, there is a spell of dry weather in North India and widespread rainfall in the coastal districts of Madras and Orissa where October and November are often the rainiest months of the year. The south-west coast of India, by-passed by the Bay current earlier in the year, receives most of its rain during November and December.

The climatic regions of India, based on the dominant factor of rainfall, may be arranged thus: (i) regions with more than 80 inches of annual rainfall such as the West Coast (with a long dry season in the north and a short dry season in the south), Bengal and Assam ; (ii) regions with 40 to 80 inches of rainfall such as the North-East plateau and the middle Ganges Valley ; (iii) regions with 20-40 inches of rainfall, such as Madras (in which the wettest months are November and December), Southern and North-Western Deccan (with mean January temperatures of 65° 75° F.) and the upper Gangetic Plain (with lower January temperature and higher July ones). To these may be added the Himalayan Sub-mountainous regions with very heavy rainfall.

Economic Structure The per capita annual income (Rs. 281, 1953-54) in India is very low. The major portion of the working force is engaged in agriculture (1027 lakhs). The total working force of the population is 1432 lakhs as against the total population of 3593 lakhs (1950-51 Statistics). The net output from agriculture is Rs. 4890 crores out of the total net domestic production of Rs. 9550 crores.

The distribution of the spending power in rural population can be seen from the Table I.

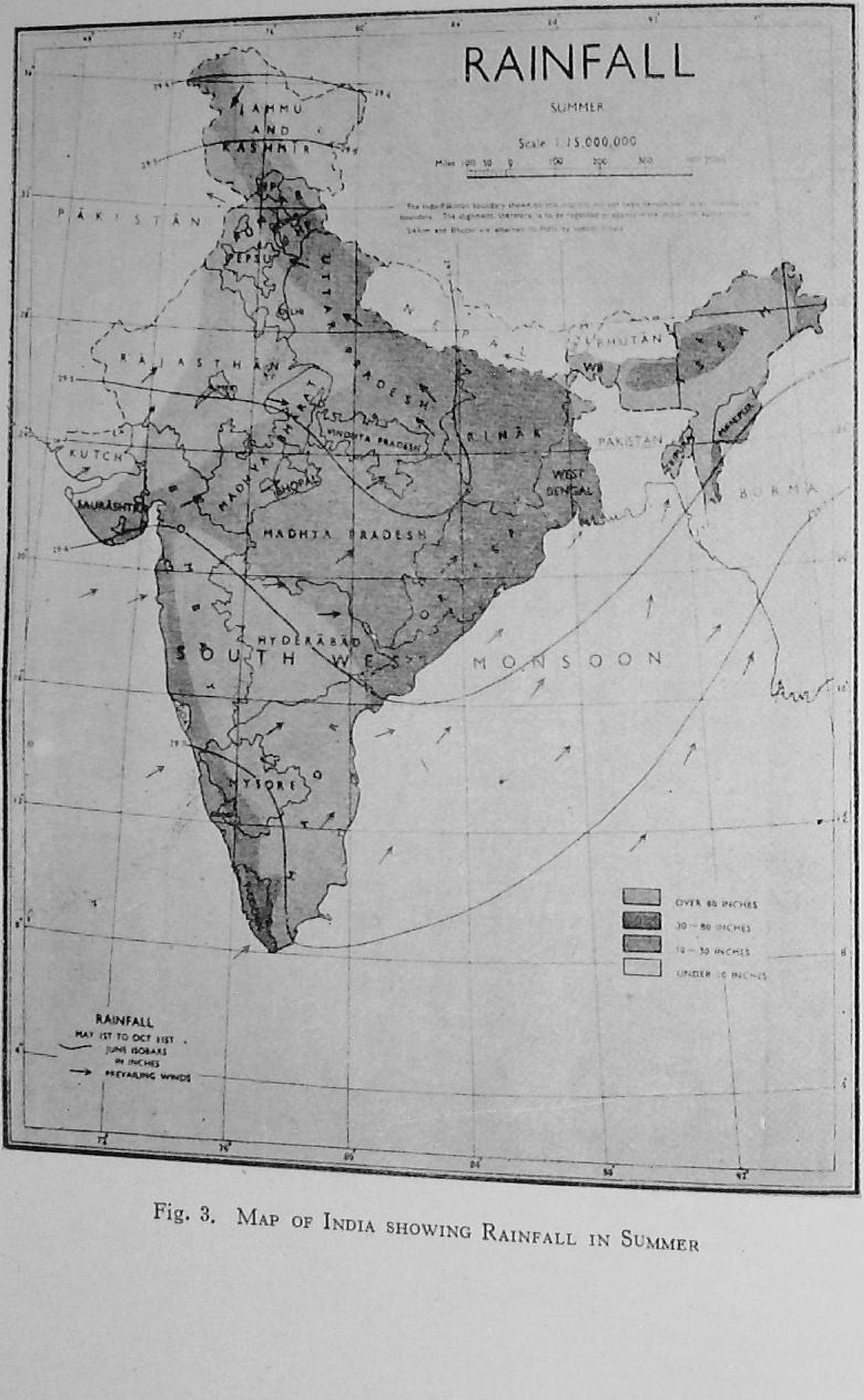


Fig. 3. MAP OF INDIA SHOWING RAINFALL IN SUMMER

TABLE I. PERCENTAGE DISTRIBUTION OF RURAL HOUSEHOLDS BY SIZE OF MONTHLY EXPENDITURE (APRIL—JUNE 1951)

Expenditure per month (in rupees)	Proportion of total number of households (percentage)
Upto Rs. 50	20.4
51- 100	31.2
101- 150	21.1
151- 200	10.4
201- 300	9.5
301- 400	3.6
401- 500	1.5
501- 600	0.6
601- 800	1.0
801-1,000	0.3
Over 1,000	0.4
Total	100.0

Land Utilisation. The total geographical area of the country is 81.08 crore acres. The progress of the pattern of land utilisation can be seen from Table III. Of the total cropped area of 35.24 crore acres, only 17 per cent is irrigated. Area under irrigation is shown source-wise in Table II.

TABLE II. AREA UNDER IRRIGATION

Source	1947-48	1954-55	Increase or decrease
Canals	198	223	+25
Tanks	80	98	+18
Wells	125	164	+39
Other Sources	64	59	— 5
Total	467	544	+77

Table IV shows cultivated and irrigated areas in the pre-reorganised States.

TABLE III. PATTERN OF LAND UTILISATION

	1950-51 (In crores of acre)	1954-55 (a) (In crores of acres)
Total geographical area	81.08	81.08
Total reporting area	71.25	72.15
Forests	10.00	13.34
Not available for cultivation		
(i) Land put to non-agricultural use	2.31	4.20
(ii) Barren and unculturable land	9.43	7.98
Total	11.74	12.18
(a) Provisional		
Other uncultivated land excluding fallow lands	1950-51	1954-55 (a)
(i) Permanent pastures and grazing lands	1.65	2.72
(ii) Land under tree crops and groves	4.90	0.97
(iii) Culturable waste	5.67	5.70
Total	12.22	9.39
Fallow Lands		
(i) Current Fallows	2.64	2.82
(ii) Others	4.31	2.93
Total	6.95	5.75
Net area sown	29.34	31.49
Total cropped area	32.59	35.24
Area sown more than once	3.25	3.75

The area under major crops for the entire country together with production is shown in Table V.

Cropping Seasons. The main cropping seasons in India can broadly be divided into *kharif*, *rabi* and *zaid* (hot weather) seasons. The *kharif* extends from May/June to October/November, the *rabi* extends from September/October to March/April and the *zaid* extends from March/April to June/July.

TABLE IV. CULTIVATED AND IRRIGATED AREA IN THE STATES (1953-54)

State/ Territory	Total geographical area (reporting) (Thousand acre)	Net cultivated area	Percentage of cultivated to total area	Net irrigated area (Thousand acre)	Percentage of irrigated to cultivated area
STATES					
Andhra Pradesh	6,61,38	2,72,72	41.2	65,85	24.1
Assam	3,57,64	50,81	14.2	13,74	27.0
Bihar	4,24.41	1,92,32	45.3	41,97	21.8
Bombay	12,06,19	6,60,32	54.7	34,33	5.2
Jammu and Kashmir	59,02	16,81	28.5	6,49	38.6
Kerala	93,72	43,31	46.2	8,10	18.7
Madhya Pradesh	10,71,30	3,75,40	35.4	20,57	5.5
Madras	3,19,67	1,40,34	43.9	52,39	37.3
Mysore	4,59.25	2,43,78	53.1	16,33	6.7
Orissa	3,84,01	1,41,16	36.8	17,39	12.3
Punjab	3,02,90	1,68,94	55.8	74,79	44.3
Rajasthan	8,45,91	2,66,90	31 6	28,76	10.8
Uttar Pradesh	7,25,11	4,09,59	56.5	1,25,87	30.7
West Bengal	2,21,95	1,32,47	59.7	28,55	21.6
UNION TERRITORIES					
Delhi	3,66	2,27	62.6	88	38.8
Himachal Pradesh	23,03	6,67	29.0	93	13.9
Manipur	3,46	2,03	58.7	—	—
Tripura	26,34	4,62	17.5	...	...
Andamans and Nicobar Islands	78	12	15.4	...	...
Laccadive, Minicoy and Amindivi Islands	...	...	...	...	...
INDIA *(Total)*	71,89,73	31,30,58	43.5	5,36,94	17.2

The season and duration of principal crops in the country is shown in Table VI.

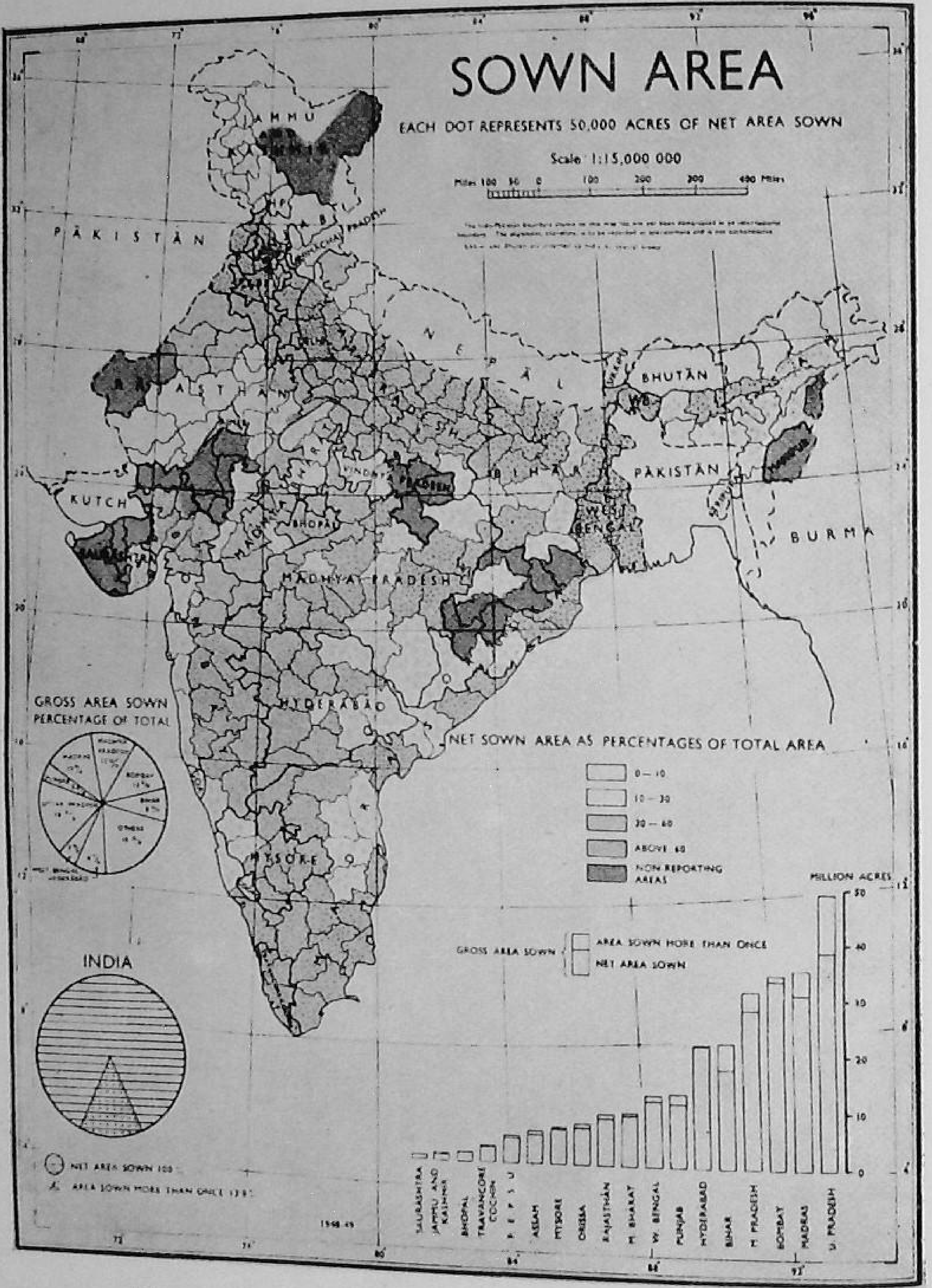


Fig. 4. Area Sown under Different Crops in the Country

TABLE V. AREA AND PRODUCTION OF PRINCIPAL CROPS

Crops	Area (Lakh acres)			Production (Lakh tons)		
	1950-51	1955-56	Increase or Decrease	1950-51	1955-56	Increase or Decrease
			Foodgrains			
Rice	761.4	762.5	+ 1.1	202.5	254.7	+ 52.2
Jowar	384.8	427.2	+42.4	54.1	69.4	+ 15.3
Bajra	223.0	270.3	+47.3	25.5	34.0	+ 8.5
Maize	78.1	89.1	+11.0	17.0	25.2	+ 8.2
Wheat	240.8	292.3	+51.5	63.6	83.5	+ 19.9
Parley	76.9	81.5	+ 4.6	23.4	27.2	+ 3.8
Ragi	54.4	56.3	+ 1.9	14.1	18.4	+ 4.3
Other cereals	113.7	130.8	+17.1	17.2	21.1	+ 3.9
Pulses	471.8	551.0	+79.2	82.8	101.9	+ 19.1
Total	240.9	2,661.0	+256.1	500.2	635.4	+135.2
			Oilseeds			
Groundnut	111.1	125.9	+14.8	34.3	38.0	+ 3.7
Castorseed	13.7	14.6	+ 0.9	1.0	1.3	+ 0.3
Sesamum	54.4	57.4	+ 3.0	4.4	4.6	+ 0.2
Rape and Mustard	51.2	62.6	+11.4	7.5	8.3	+ 0.8
Linseed	34.7	34.2	— 0.5	3.6	3.8	+ 0.2
Total	265.1	294.7	+29.6	50.8	56.0	+ 5.2
			Other Crops			
Cotton	145.4	202.3	+56.1	29.1(a)	40.0(a)	+ 10.9
Jute	14.1	15.8	+ 1.7	32.8(b)	41.4(b)	+ 8.6
Sugarcane (Gur)	42.2	44.5	+ 2.3	56.2	58.6	+ 2.4
Tobacco	8.8	9.2	+ 0.4	2.6	2.6	—
Tea	7.8	7.8	—	6073.2 (Lakh lb.)	5887.3(c)	—185.9
Coffee	2.2	2.3	+ 0.1	543.2	556.2(d)	+ 13.0
Rubber	1.4	1.7	+ 0.3	318.3	447.0	+128.7

N.B.—(a) denotes lakh bales of 392 lb. each and (b) denotes lakh bales of 400 lb. each (c) and (d) denotes that the figures are for the calendar year 1953 and 1953-54 respectively.

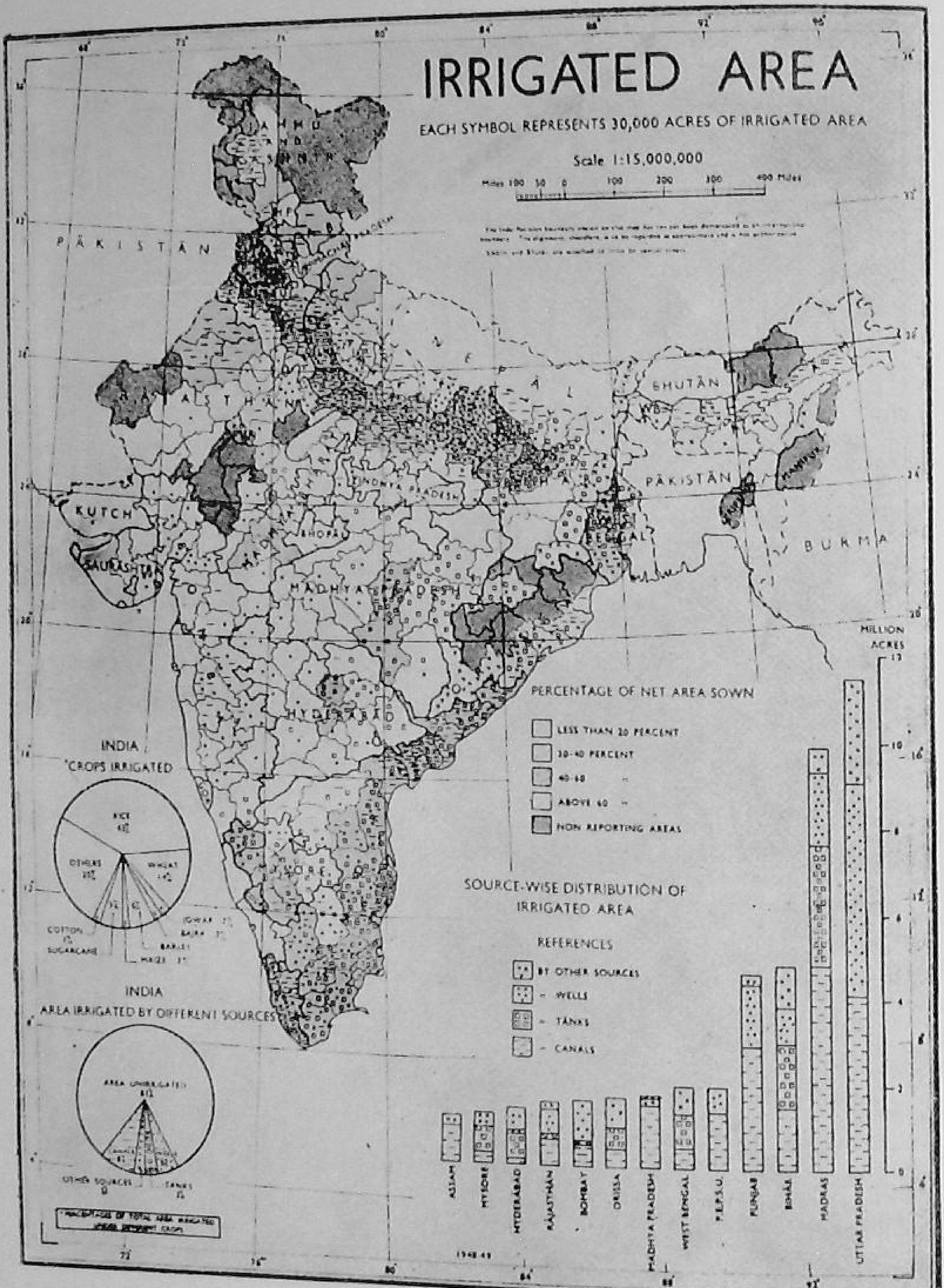


Fig. 5. Area under Irrigation in India

TABLE VI. PRINCIPAL CROPS, THEIR SEASONS AND DURATION

Crop	Season		Duration (a) (months)
Rice	Winter		5.5—6
	Autumn		4.0—4.5
	Summer		2.0—3.0
Wheat	*Rabi*		5.0—5.5
Jowar	*Kharif*		4.5—5.5
	Rabi		4.5—5.0
	Zaid Kharif		2.5
Bajra	*Kharif*		4.5
Maize	*Kharif*		4.0—4.5
Ragi	*Kharif*		3.5
Barley	*Rabi*		5.0—5.5
Gram	*Rabi*		6.0
Sugarcane	Perennial		12—15
Sesamum	*Kharif*		3.5—4.0
	Rabi		5.0
Groundnut	*Kharif*	Early	4.0—4.5
		Late	4.5—5.0
Rape and Mustard	*Rabi*		4.0—5.0
	Zaid Rabi		4.0
Linseed	*Rabi*		5.0—5.5
Castor	*Kharif*	Early	6.0
		Others	8.0
Cotton	*Kharif*	Early	6.0—7.0
		Late	7.0—8.0
Jute	*Kharif*		6.0—7.0

(a) No. of months the crop is on land.

No survey pertaining to Indian agriculture will be complete without reference to the fragmentation of holdings. The operation of the ancient laws of inheritance and social upheavals in the country's past has resulted in sub-divisions and fragmentation of the holdings to the detriment of agricultural production. The problem is really very serious and no short term remedy is possible. Legislative measures to decide the size of minimum holdings are under contemplation in most of the States to combat this evil. For instance, Uttar Pradesh, has fixed a minimum of 6½ acres as the limit, Hyderabad 2 to 24 acres, Delhi 8 standard acres, and Madhya Bharat and Bhopal 15 acres. Vindhya Pradesh has prescribed as the minimum limit of 5 acres for irrigated land and 10 acres for dry land. The consolidation of the fragmented holdings is not an easy task. The position can be seen from the results of the survey of land holdings conducted in 22 States in 1953-54. (Appendix III).

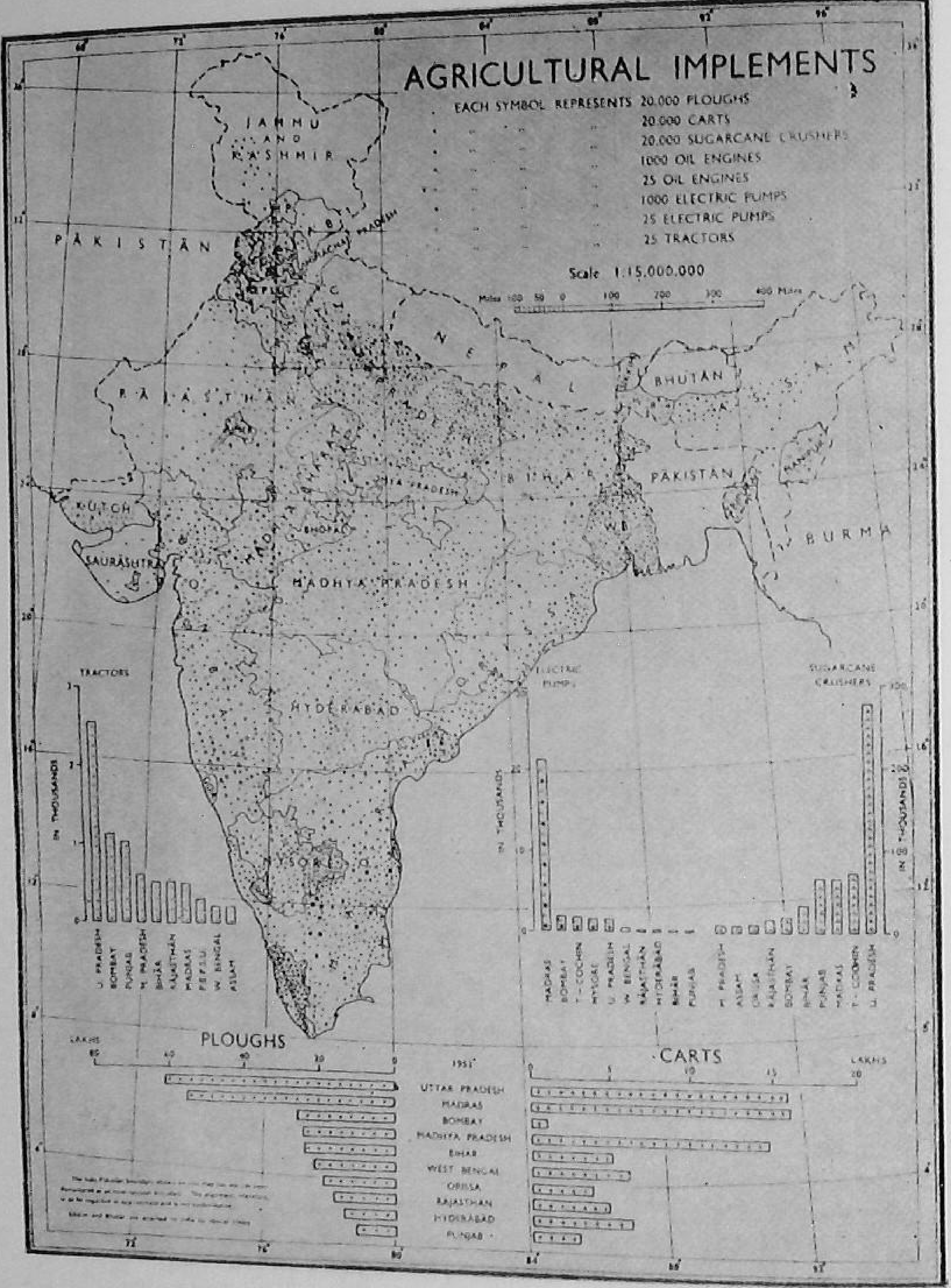


Fig. 6. Distribution of Agricultural Implements in Various Parts of Country

CHAPTER IV

MANUFACTURE OF AGRICULTURAL IMPLEMENTS IN INDIA

The Indian system of agriculture is undoubtedly of very ancient origin. It is interesting to observe that the sage Parasara is credited with having given the following description of the plough as given in *Agriculture in Ancient India* by Gangopadyaya published by N.C. Mukerjee and Co.

Plough. In the *Krishi Sangrah* Parasara describes the plough and its accessories as below :

"The plough consists essentially of the following 8 parts—*Isa* (the pole of the plough), *Yuga* (the yoke), *Niryola* (the rod of the plough exclusive of the pole and the share), *Niryolapasika* (iron plates that fix the share to the *Niryola,* there are two pairs of *Pasika*), *Halasthanu* (a strong piece of wood that is fixed to the *Niryola* at the end opposite to where the plough-share is fixed ; this is held by the cultivator while ploughing the field), *Addacalla* (the pins of the yoke where the bullocks are tied), *Saula* (an extra piece of wood that tightly fixes the *Niryola* to the pole) and *Paccani* (driving stick), *Avandha* (a rod of iron which prevents the *Niryola* from getting out of the pole), *Yoktra* (tie yoke) and *Phala* (ploughshare). The rough dimensions of the above plough-parts have also been furnished in the description.

Besides the plough and its accessories as enumerated by Parasara, the implements *Srni* (sickle), *Khanitra* (hoe), *Musala* (pestle), *Udukhala* (mortar), *Surpa* (winnowing basket), *Dhanyakrt* (winnowing fan), *Calani* (sieve) *Sthivi* (granary), *Methi* (the post of the threshing floor round which cattle turn to thresh out the grains) were also in vogue.

It may be mentioned in this connection that the pattern of ploughs now in use has not materially changed from what has been described by sage Parasara in his *Krishi Sangrah*.

Power on the Farm. A pair of bullocks is the most commonly used form of draught-power for agricultural purposes. In some regions, buffaloes are employed for farming operations whereas camels are used in the State of Rajasthan and some parts of the Punjab. Multiple pairs of bullocks and in some cases buffaloes are used in deep ploughing operations with heavy implements in

black-soil areas. Single animal is employed both for the working of field implements and general haulage purposes.

For working of the small tools and implements manual power is the main agency all over the country.

Cultural Practices. The cultural practices which influence the use of implements may be grouped broadly under 5 main heads :

1. Cultural practices prevalent in rainfed areas under dry cultivation
2. Dry farming cultural practices prevalent in black soils
3. Cultural practices prevalent under irrigated conditions
4. Cultural practices in growing crops like paddy in wetland cultivation
5. Cultural practices prevalent in hilly regions.

The type of an implement depends upon the prevalent pattern of cultivation. Under rainfed conditions, for growing dry crops the sequence of field operations is as follows :—

1. Ploughing
2. Harrowing
3. Clod crushing and compaction of seed bed by planks or rollers
4. Sowing
5. Inter-cultivation between rows of standing crops

Dry farming in black soils involves some specialized techniques, as is clear from the widespread use of the blade harrow (*Bhakhar or Guntaka*), and the blade-hoe (*Guntaki and Dora*). Another practice peculiar to black soils is the practice of summer ploughing for which very heavy ploughs (Plate 23) weighing as much as 120-180 lb. are needed. These heavy ploughs require several pairs of animals. Rao Bahadur Kelkar in his survey carried out in 1914 mentions that 1 to 5 pairs of animals are needed for such ploughs. The current survey has shown that for this operation, the mould-board type or iron ploughs have almost superseded the heavy indigenous ploughs. Consequently, in many areas the cultivators are now taking to tractors for this type of deep ploughing.

In some areas such as West Khandhesh, where the moisture level recedes very rapidly, deep sowing has to be resorted to, and for this purpose heavy duty indigenous ploughs fitted with seeding attachments are used, so that the sowing is also accomplished along with the ploughing, at greater than normal depths. Except for this isolated instance, the general practice in black soils is shallow preparation using exclusively blade harrows followed by sowing below the soil mulch thus created.

The intercultural operations in black soils are carried out by

means of *Kolpas* and *Doras* (Plate 69) (blade hoes, Plate 66). The practice of growing green manure is being progressively adopted in irrigated areas. The green manure crop is usually turned down and buried by a mould-board type of plough. This is followed by harrowing, planking and levelling. Sowing is done in a well pulverised and levelled seed bed, thus attained. Considerable proportion of irrigated acreage is devoted to crops sown in lines and on ridges. For intercultural operations, the use of hand hoes appears to be quite popular.

The main characteristic of wetland cultivation is working the soil in standing water. The type of ploughs used in these areas are typified by broad shoes (Plate 25) ideally suited for puddling operation. In these areas, the practice of green manuring is fairly prevalent. The traditional source of green manure is the forests in the vicinity of the fields. The usual practice in Malabar and Konkan coast, for example, is to maintain 4 acres of forests for every acre of wetland where paddy is grown. In this connection it may also be mentioned that in such cases, it will be advantageous to grow the green manure in the field and bury it under by using a mould board plough, as is prevalent in other parts. The practice is, perhaps, not being widely followed at present because a suitable type of plough has not been popularised in these areas. It is worth mentioning in this connection that animals available in these localities are usually small in stature and are not suitable for mould board plough.

Wetland puddlers and green manure tramplers may be seen widely used in these localities. Weeding and intercultural operations are mostly done by hand tools. In general, it may be remarked that cultural operations in wetland farming are very costly.

Assam, Himachal Pradesh, Coorg, some parts of Uttar Pradesh, Bombay, Travancore-Cochin and Madras can be classified as hilly tracts. It is observed from the reports of these States that the implements in use are generally light in weight. They are either drawn by a single animal as in Assam. (Plate 2) or by a pair. The animals are of short stature but are strong enough to take up heavy draft. In some places the use of animals for cultivation operations becomes very difficult due to the steep slope of the land and generally the implements worked manually are used. The fields are irregular in shape and small in size which make the use of animals impracticable. The soil erosion problem being serious due to steep slopes and heavy rains, the cultivation is done on bench terraces. Tea, coffee, fruits, cereals and vegetables are the major crops grown in these areas.

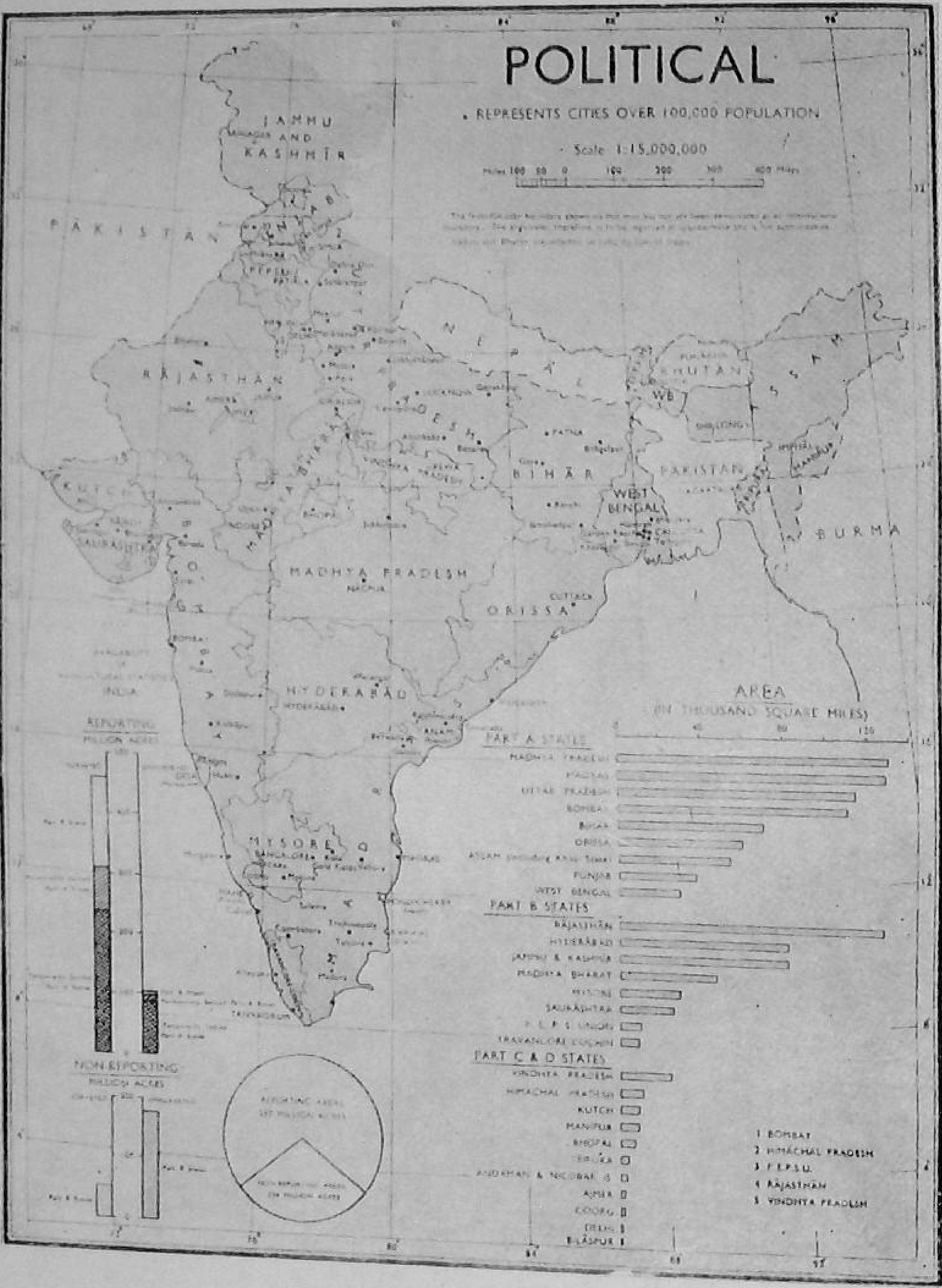


Fig. 6a. Political Map of India

CHAPTER V

FEATURES OF PARTICIPATING STATES

In this chapter the general features such as the total area, population, extent of land cultivated under different crops, soil and climatic conditions and methods of irrigation in each State have been outlined briefly. The survey was carried out in the various States as they existed prior to reorganisation.

ANDHRA PRADESH

The total area of Andhra Pradesh is 106,041 square miles. The population according to the census of 1951 is 31,260,133.

The total cultivated land under different crops in the State in the year 1954-55 was 94,19,000 acres. The average rainfall in this territory varies from 30 inches to 60 inches per annum. The principal crops grown in the State are :

Food Crops. Rice, *jowar*, *bajra*, maize

Oilseeds Crops. Sesamum, linseed, mustard, groundnut

Other Crops. Cotton, sugarcane, tobacco and vegetables.

Soils. Soils of Andhra Pradesh are divided into the following categories and there are also combinations of these types.

1. Alluvial
2. Black soil (*Regur*), clay or clay loams
3. Red soils, red sandy loam
4. Laterite
5. Sandy soils (Coastal area)

The main sources of irrigation water for raising various crops are rivers, canals, tanks and wells.

ASSAM

The extreme North-East frontier State of Assam, is almost bottled between Bhutan and Tibet on the north, Burma on the south, China and Burma on the east and East Pakistan on the west, except for the small strip of West Bengal which connects it with the rest of India. It has an area of 85,012 square miles. It is about 450 miles in length and 200 miles in breadth.

Monsoon conditions prevail in the State generally from the middle of April to the middle of October, the intensity being maximum during the months from June to August. The intensity of rainfall also varies from district to district, being about 60 inches only in Nowgong district and about 300 inches in Khasi and Jantia hills.

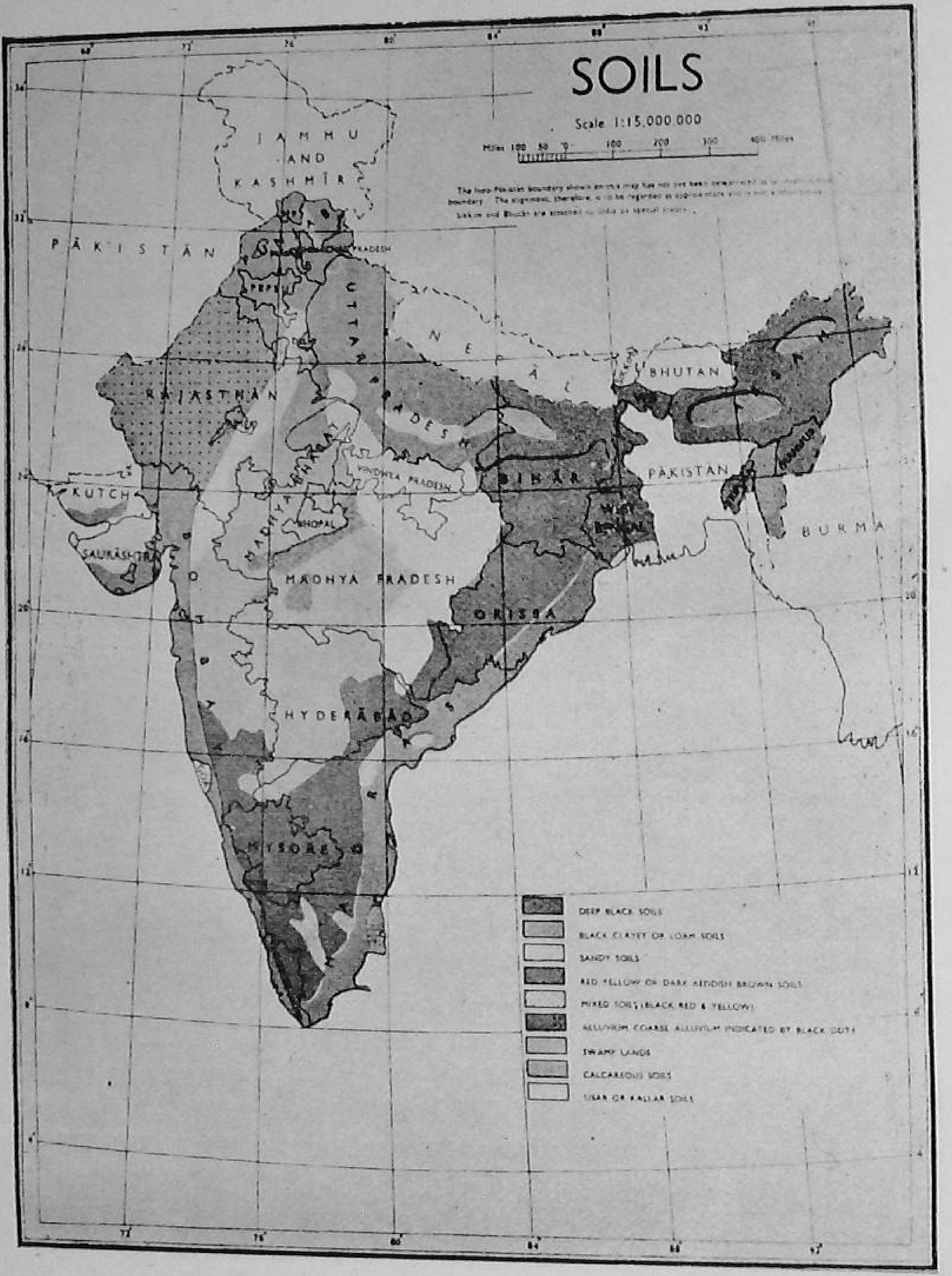


Fig. 7. Distribution of Soils in India

The rainfall is derived chiefly during the South-west Monsoon from the Bay of Bengal. The average rainfall of the State for the year 1953 was 116.23 inches.

The total cultivated land under different crops in Assam in the year 1951-52 was 5,828,071 acres. The chief food crops grown in the State are rice, maize and wheat. The main oilseed crops are sesamum, mustard, rape, linseed and castor. The fibre crops are cotton and jute. The other crops produced in the State are condiments, spices, fruits, vegetables and sugarcane.

Soils. Soils of the State can be classified as follows :

1. Old alluvium
2. Sub-mountainous tract
3. New alluvium
4. Low lying heavy clay
5. Alluvium
6. Laterite
7. Hill soils mostly red, loam and laterite

BIHAR STATE

The State of Bihar occupies a total area of 70,330 square miles and its population as per census of 1951 is 40,225,947.

The rainfall in the State has been found to vary between 38 inches and 68 inches with an annual average of 50 inches, 90 per cent of which falls during the months of June to September. The zonal variations are, however, considerable. The average annual rainfall for the Himalayan Valley and northern districts of Purnea, Darbhanga, etc. is 56 inches and Chhotanagpur districts like Ranchi and Singhbhum is 55 inches while for Patna, Gaya and Shahabad it is only 43 inches.

Soil. The following six soil divisions have been recognised in the State :

Calcareous : Calcareous soils occur in the whole of Saran and certain portions of the districts of Muzaffarpur, Champaran and Darbhanga.

Non-calcareous soils : They cover the whole of North Bihar excepting the district of Saran and certain portions of Muzaffarpur, Champaran and Darbhanga where the calcareous soils are found.

Heavy clay : Heavy clay soils occur to the south of the Ganges mainly in the districts of Patna, Gaya and Shahabad.

Sone alluvium : This Division is found in Patna, and Shahabad districts of Sone Valley.

Brown soils : These soils occur in the districts of Monghyr and Bhagalpur lying to the south of the Ganges.

RED LOAM AND LATERITE : These soils cover the entire Chhota-nagpur belt.

The State of Bihar lying between the comparatively drier tracts of North India and wetlands of West Bengal grows a variety of crops, i.e. all the main foodgrains as well as sugarcane, jute, chillies, tobacco, oilseeds, potatoes, vegetables and other cash crops. Paddy being the chief staple food crop occupies nearly half the cultivated area. Crops like maize, gram, pulses and other crops are grown in considerable areas to supplement the food reserves of the State.

BOMBAY STATE

The total area of the Bombay State is 115,570 square miles. The population as per census of 1951 is 35,944,000.

The rainfall of Bombay State is derived chiefly from the South-west Monsoon, between June and October. In the eastern tracts of the Deccan and Karnatak, this supply is greatly supplemented by the North-east Monsoon which follows the close cf the South-west Monsoon. The South-west Monsoon touches North-Kanara and the Southern districts first and makes its way up towards Gujerat. As it advances to the north, the amount of precipitations decreases from south to north along the coast. The Konkan districts including Western Ghats receive heavy rainfall varying between 250 inches to 60 inches between its southern and northern boundaries. The rainfall from the South-west Monsoon also decreases eastwards from the Western Ghats. The districts of Bijapur, Sholapur, Ahmednagar and eastern parts of Poona, Dharwar, Belgaum, Satara, parts of Nasik district and bulk of the area of Central and North Gujerat get scanty rainfall.

The total cultivated land under different crops in Bombay State in the year 1950-51 was 4,26 02,600 acres.

Soils. Soils of Bombay State are divided under the following 11 categories :

1. *Goradu*—sandy loam from alluvium
2. Coarse shallow - soil from granites
3. Deep black—soil from basalt
4. Medium black—soil from basalt
5. Coastal alluvium
6. Clay-loam and coarse sandy soil in valleys and on hill slopes
7. Laterite soils
8. Sandy soils from sandstone
9. Mixed red, black and brown soil from shales, basalt and granites
10. Desert soils
11. Salt lands and alkaline soils

The main food crops grown are rice, wheat, *jowar*, *bajri*, and maize. The other major crops grown in the State in order of the area covered by them are cotton, groundnut, tobacco and sugarcane.

COORG STATE

The climate of Coorg is characterised by high humidity and low temperatures. The temperature generally varies from 50°F. to 55°F. in December to about 90°F. to 98°F. in the months of April and May. The relative humidity ranges from 100 per cent in the monsoon months of June, July and August to about 60 per cent in dry months.

The annual rainfall varies from 40 inches along the eastern border to about 250 inches along the western border, the average being about 100 inches. Scattered showers are also received during March and April which are very beneficial for the plantations.

Soils. The soil in the Eastern zone is mostly black clay, which is water-logged in monsoon and cracks in summer. The soil of the Central zone is light brown in colour and loam to clay loam in texture. In the Western zone the soil is highly leached and tends to be lateritic and is highly deficient in lime with iron and manganese concentrations. As a result of heavy leaching, the soil is rendered shallow. Poorly drained soil in big patches exists in the southernmost part of the zone. Food crops and coffee are the main crops of the State.

HIMACHAL PRADESH

Climatic and topographical conditions vary very much in the State which can thus be easily divided into three zones.

Outer Himalayan Region. The boundaries of this area touch the plains of Punjab and it gets 60 to 70 inches of rainfall. This is a zone of valleys with groups of villages. Scanty population is scattered on the sides of these hills. Each group of villages is generally separated from other groups by a hill or a stream.

Interior Himalayan Region. This zone comprises narrow valleys and steep mountains. The rainfall fluctuates between 30 to 40 inches per year. The area is thinly populated. The population generally lives along the banks of rivers. Some villages also exist here and there on the sides of mountains where cultivable lands are available. The villages have very little inter-communications.

Mountain Pastures. This region is very thinly populated. People use yaks and *churus* for ploughing and milk production. As the area remain sunders now for about five to six months in a year,

most of the population migrates during winter and returns home during summer.

The principal crops grown in the State are wheat, rice, maize, *jowar*, vegetables, fruits and fodder crops.

Soils. The soils of Himachal Pradesh can be broadly divided into following categories :

1. The low-hill soil-zone found between an altitude of 1,500 to 3,000 ft.
2. The mid-hill soil-zone found between an altitude of 3,000 to 5,000 ft.
3. The high-hill soil-zone found between an altitude of 5,000 to 7,000 ft.
4. The mountainous soil zone comprising soils on high peaks between 7,000 to 10,000 ft. above sea level.
5. Dry-hill soil-zone comprising of Chini tehsil of Mahasu district and Pangi tehsil of Chamba district.

MADHYA PRADESH

The total area of Madhya Pradesh is 1,71,052 square miles. According to the census of 1951, its population is 2,60,71,654. It has a net sown area of 3,80,58,031 acres of which only 20,72,750 acres are irrigated.

Food Crops. Paddy, *jowar*, *bajra*, maize, wheat, barley

Other Crops. Cotton, sugarcane, groundnut, linseed, gram, *tur*

The climate in general is wet and humid in the Chattisgarh plains, temperate in Malwa and dry in Gird region. The rainfall ranges from 30 to 35 inches in the eastern parts to about 60 inches in the Chattisgarh area.

Soils. The soils in the State can be classified as follows :

1. Alluvial soils
2. Black soils
3. M xed red and black soils
4. Red soils

MADRAS STATE

Madras State is bounded on the east by the Bay of Bengal and the Gulf Mannar and on the west by Kerala State and part of Mysore State. On the north it is bounded by parts of Mysore and Andhra and the Indian ocean on the south.

The State comprises 13 districts (of which Madras city is one), with an area of about 50,000 square miles and a population of 29.2 millions excluding Kanyakumari.

The State has a high mean temperature but the variation is not

so great as in other parts of India.

The total rainfall in the State varies from 30 inches to 70 inches except on the western slopes of Nilgiris and Anamalais where it amounts to more than 100 inches. In a few localities the rainfall exceeds 50 inches. These are Kodaikanal, Shevaroys and the eastern slopes of Nilgiris where the rainfall ranges from 50 to 65 inches. In other parts of the State, the rainfall ranges from 30 to 50 inches.

The soils of the State are for the most part loamy, gravelly and sandy derived from the disintegration of the rocks, alternated by the alluvium of the great river deltas. Black soils are found in the southern part of Coimbatore and the Palni taluk of Madurai adjoining and in the southern parts of Madurai and the neighbouring taluks of Ramanathapuram.

Paddy and *cholam* are the main food crops grown in the State. The principal commercial crops are tobacco and cotton. The miscellaneous crops produced in this State are sugarcane, groundnut, coconut, castor, fruits, vegetables and fodder crops.

ORISSA

The State of Orissa lies between 170°.31′ - 28°-31′ N. latitude and 81°.31′ -- 57°.30′ E. longitude covering an area of 60,136 sq. miles. It is surrounded by Ranchi and Singhbhum districts of the State of Bihar to the North, Midnapur district of the State of West Bengal to the North-East, Raigarh, Raipur and Bastar districts of the State of Madhya Pradesh to the West and Srikakulam, Vishakhapatnam and East Godavari districts in the State of Andhra Pradesh to the South, while the Bay of Bengal runs along the entire eastern boundary. The population accordiug to the census of 1951 is 1, 46, 45, 946.

The State is situated well within the tropical belt and as such has high temperature with medium rainfall. Geographical characteristics, however, affect distribution of rainfall and also control the temperature. There are four well-defined seasons, namely, (i) cold dry winter in December, January and February, (ii) hot dry summer in March, April, May and till 15th June, (iii) sultry humid monsoon from 15th June, July, August and September, and (iv) autumn in October and November.

The average annual rainfall of the State is 55 to 60 inches and the maximum precipitation is during the months of June to September with nearly 45 to 50 inches of rainfall.

The mean maximum temperature of the year is 32.8°C. (91°F.) which rises to 38.3°C. (101°F.) in April and May. The mean minimum temperature is 22.8°C. (73°F.) which falls to 15°C. (59°F.) in December. The average annual humidity at 8 A.M. is 79 per cent which rises to

84 per cent in August and falls to 74 per cent in May the annual variation range being only 10 per cent.

Soils. The different soil types that are met with in Orissa may be summarised as follows :

(a) ZONAL (i) Black earth or regur in the Mahanadi valley
(ii) Red earth in northern plateau
(iii) Yellow earth in the Mahanadi valley
(iv) Laterite soil in the Eastern Ghat region
(v) Bauxite laterite in Kalahandi.

(b) INTRAZONAL (i) Plasonal in the Northern plateau
(ii) Rendzina in the Northern plateau
(iii) Brown forest earth in the Eastern Ghat region

(c) AZONAL (i) Lithosal—Non detral in the Eastern Ghat region
(ii) Alluvial soil in the coastal districts.

Principal Crops Grown. The total area under cultivation is 12524719 acres, and of the cultivated area 91.7 per cent accounts for food crops, 4.1 per cent for oilseeds, 1 per cent for miscellaneous crops, 0.7 per cent for fibre crops, 0.7 per cent for dyes and narcotics, 0.6 per cent for sugarcane, 0.3 per cent for spices and condiments and 0.2 per cent fodder crops.

Rice is the major crop and the staple food of the people of the State. The total area under this crop is nearly 9.3 million acres. Out of the total area under rice, 8.85 per cent accounts for winter variety of *sarad* paddy while 10.7 per cent for autmn variety of *biali* and 0.8 per cent for summer variety of *dalua*

Generally, in the poorer lands where sufficient moisture is available, *ragi*, *bajra*, *jowar* and *sowan* are grown. With the exception of *ragi* the other millets are generally grown in the plateau ranges as they are the favourite food of the *Adibasis*. *Ragi* is also grown in the coastal area. Maize forms another important crop in the hill regions. A very small area is under wheat. In the hill area *arhar* is grown as a rainfed crop during the months of October to November or a little before the season of monsoons in the areas of Angul, Boudh, Bolangir and Omarkote. *Mung*, *urd*, *kulthi*, peas and cow-peas are grown as rainfed crops. In the coastal districts, the pulses are grown in the flooded areas generally after the damage of flood is over.

The principal vegetables are potato, sweet-potato, tapioca and arum, but the areas covered by these crops are not much. Brinjal, pumpkin, gourd, cabbage and cauliflower, etc., are limited to vegetable gardens only.

Sugarcane is widely grown in the Mahanadi valley and in the Tel Basin, Kalahandi and Sonepur, in the area of Rayagada,

Gunupur and in the Indrabati valley of Koraput. The areas around Aska in Ganjam have sugarcane cultivation also.

The chief types of oilseeds are niger, mustard, linseed, sesame, groundnut, and castor. Niger is grown in the hilly areas of Koraput and Ganjam being a rainfed crop. In some areas it is also sown in October and November; mustard, linseed and castor are generally grown in the river basin of hilly areas and on the silt-deposited areas of flooded tracts. Groundnut is grown in the sandy soils of the coastal districts as also in the laterite soil of Parlakimedi and Angul and areas in the plateau regions. Coconut is a plantation crop all over the coastal belt.

Jute is a most important fibre crop grown in the coastal districts. In the tablelands and Eastern Ghat regions mesta is grown. Cotton is grown in the areas of Bargarh, Bolangir, Kalahandi and Gunupur as a rainfed crop. It has been extended in the coastal areas generally under irrigated condition.

PUNJAB

The State of Punjab can be divided into the following regions :

Mountainous Region. Mountainous region consists of Kangra District. Maize, rice, tea and fruits are grown in this tract.

Sub-mountainous Region. This includes the districts of Ambala, Hoshiarpur and Gurdaspur.

Plains. (i) Comprising Ferozepur, Amritsar, Ludhiana and Jullundur : all kinds of crops are grown here. (ii) Comprising Karnal, Hissar, Rohtak and Gurgaon : jowar, gram, *sarson* and *bajra* are grown here. The last region depends for its irrigation almost entirely on rains but now canals from the Bhakra Project will command most of the land falling in this region. Over the greater part of the Punjab, summer temperatures are very high and winter temperatures very low. In December and January the temperature at night sometimes goes below freezing point.

The South-west Monsoon reaches Punjab about the end of June and most part gets rain about the middle of July. The mountainous and sub-mountainous areas get more rains whereas in the region called Haryana Prant, there is less rainfall. The total rainfall in winter, however, is generally much less than in summer. In the mountainous region it is over 40 inches and in places like Dharamsala it may average 100 inches. In the sub-mountainous region it rains from 30 to 70 inches. In plains it is 10 to 30 inches, but in some of the parts of Amritsar, Jullundur, Ludhiana and Karnal districts it is generally over 30 inches and does not exceed 40 inches.

Soils. The soil of the Punjab plains is practically alluvial, i.e., deposited by the rivers. In consistency it is generally sandy loam

and heavy clay is also found in different parts of the State. While the soils are, generally speaking, very uniform, considerable variation sometimes occurs in different parts of the same field.

(a) MOUNTAINOUS REGION : Soils are of red, yellow and black colour. In the greater part of this region the soils are generally acidic. In the lower part of Kangra district which is very small as compared to the whole region the soils are both alkaline and acidic.

(b) SUB-MOUNTAINOUS REGION : In the upper parts of this region both alkaline and acidic soils are found while in the lower regions the soils are neutral to alkaline.

RAJASTHAN

The State of Rajasthan is situated between 23°—3′ N. and 30°—12′ N. Latitudes and 69°—30′ E. and 78°—7′ E. longitudes. It is nearly square in shape with 540 miles from East to West and 510 miles from North to South. The total geographical area is 130,207 square miles.

The climate of Rajasthan, west of the Aravalli Hills constituting Jodhpur, Bikaner and some parts of Jaipur Division is extremely hot in summer and extremely cold in winter. The summer of West Rajasthan is further characterised by frequent thick and violent dust storms, during April, May and June. The soil of this region is sandy to sandy loam with 2 to 6 ft. sand dunes scattered over the whole surface.

The soils are rich varying from loam to clay including the black soil in Jhalwar district and parts of Udaipur Division, loam and clay loam in Bharatpur and Alwar districts. In parts of Udaipur Division, it is rocky with large forest areas in Dungarpur and Banswara districts. The Udaipur Division is rich in mineral wealth.

The climate of Rajasthan, as mentioned already, can be stated to be divided broadly into two distinct natural regions by the Aravalli Hills running South-West and North-East. The rainfall therefore also varies being higher in the regions East of these Hills, which comprises parts of Sirohi District, Udaipur, Kotah and Jaipur Divisions excluding Sikar and Jhunjhunu districts. In the region of West Rajasthan constituting the desert areas of Jodhpur and Bikaner Divisions, the rainfall varies from 4 inches to 20 inches from South-West to North-East.

Almost all types of crops from the wet crops e.g., paddy, sugarcane to the dry crops like *bajra*, *jowar*, etc. are grown in the State of Rajasthan. The distribution of crops is such that in the desert areas of Jodhpur and Bikaner Divisions, Jhunjhunu and Sikar districts

of Jaipur Division, *bajra* is the only important crop while in the case of Kotah Division, *jowar* is important. In Udaipur Division, there is preponderance of maize. The *rabi* crops are fairly well distributed throughout Rajasthan except in the desert areas of Jodhpur and Bikaner Divisions. The cotton crops are concentrated in Ganganagar, Jhalwar, Chittorgarh, Bhilwara and Udaipur districts.

TRAVANCORE-COCHIN

Travancore-Cochin State is a triangular strip of land lying towards the South West corner of the Indian peninsula, between the Arabian Sea on the West and Western Ghats on the East. Physically, the State could be divided into three distinct regions : (1) the low-land area consisting of a long stretch of flat land lying along the sea coast; (2) mid-land area consisting of a narrow undulated land lying between the low land and the mountainous area interspersed with rivers; and (3) the Eastern mountainous area.

The annual rainfall in the State varies from 25 inches to as much as 200 inches, the average being about 90 inches. The rainfall is low in the extreme south and increases gradually towards the North. The rainfall varies similarly from the coastal regions towards the mountainous tracts on the East. In the Central and the Northern regions of the State, there will hardly be any rainless month, the heaviest downpour showers being in June-July.

The temperature varies from 70° to 90°F. in the plains, the average being 78°F.

The main crops under cultivation in the State are paddy, coconut, tapioca, rubber, tea, ginger, pepper, cardamom, etc. Paddy is the staple food crop of the State. It occupies an area of about 8 lakhs of acres. Paddy lands are distributed mainly in the mid-land regions and also to a certain extent in the coastal regions of the State. From the foot of the ghats, the ground slopes gradually to the West, its evenness being broken by low hills and valleys making the land undulatory. The valleys are occupied by the rice crop and coconut groves and the slopes of the hills are cultivated with different varieties of edible roots and tubers, spices, pulses, and other crops.

In coastal regions and in certain areas adjoining the backwaters large stretches of saline lands exist. The soil of this area is heavy clay impervious and rich in organic matter.

UTTAR PRADESH

The total area of Uttar Pradesh is 1,13,409 square miles. The population as per census of 1951 is said to be 6,32,15,742.

The principal rainy months are July, August and September which together account for 70 per cent to 80 per cent of the total

rainfall at any place, the magnitude of which ranges from 27 inches to 50 inches. The month of highest humidity is generally August with July and September keeping pace and the month of the lowest humidity is April followed by May. The number of rainy days ranges from 30 to 45 days, except in the hill districts, where it averages from 60 to 75 days.

The principal crops grown in the State are wheat, barley, rice, gram, *jowar*, *bajra*, maize, *kodon*, sugarcane and fodder crops. The crops grown in the hill districts are rice, wheat, barley, *manduwa*, mustard, maize, tobacco, spices, tea and fruits.

The soils in the State can be classified into the undermentioned divisions :

1. Sandy alluvium in the river beds and river banks
2. Medium soils ranging from sandy loam to clayey-loam
3. Hard clay
4. Black and red soils of Bundelkhand
5. Gravelly soils in the hill districts
6. Alkaline soils

WEST BENGAL

This State has an area of 29,370 square miles. It holds roughly 6.87 per cent of the total population of India (361.1 millions).

The Southern portion of Darjeeling, Eastern portion of Malda; West Dinajpur and the so called "Rarh" tracts of Burdwan, Birbhum, Bankura and Midnapore are in general old alluvium tracts. Portions of these consist of red or laterite soils. Generally speaking, they contain red clay or loam (due to presence of iron, the colour is reddish) and mixed concretions and are deficient in lime, organic matter and phosphate content. They have very poor water holding capacity. This points out the existing natural poverty of soil, specially of the high lands, for agricultural production. This tract needs liming, manuring and irrigation for good crop yields. The soils of Howrah, Lower 24 Parganas and eastern portion of Hooghly, Nadia and Murshidabad districts are new alluvium. The soil of North-Eastern 24 Parganas, Western portions of Nadia and Murshidabad districts are old alluvium. The saline soil tracts of Sundarbans and lower Midnapore are comparatively richer. Such areas are capable of growing salt resistant varieties of paddy.

The clayey soils are found in 24 Parganas, Murshidabad, Nadia, Birbhum and part of Burdwan. The parts of Midnapore, Bankura, Burdwan, and Hooghly are lateritic. The soil of Howrah, Bankura, Jalpaiguri is mostly sandy loam (Alluvial).

Rice, jute, gram, wheat, barley, maize, linseed, sugarcane, tobacco, tea, and vegetables are the principal crops grown in the State.

In consideration of the area covered by different crops, rice is by far the most important crop of the State. Among rice, *aman* (winter rice) is the major type.

CHAPTER VI

PLOUGHS

History of the Plough. Full history of the evolution of the plough is not available. The indigenous plough is being used by Indian farmers from time immemorial.

The primitive model might have been a thick crooked twig or a branch of a tree. The weight of this model might have been light as it would have been operated by human beings. It might have been very crude as the use of metals or metallic tools was unknown at that time. Considering the model of plough and the power applied to it, it can be concluded that the depth of the ploughing in the primitive stage must have been comparatively shallow.

Later on as civilization advanced the art of cultivation progressed and men began taming and using the animals for draft purposes. The design of the earlier plough might have undergone a considerable change in view of the new requirement of deeper ploughing and utilisation of the available greater pulling power.

The next change in the design and construction might have taken place after the man came to know the use of metals. The invention and use of metals and metallic tools might have resulted in the evolution of well-shaped ploughs. Since then there does not seem to have been any radical change in the basic design of the plough excepting modifications carried out in ploughing angles and method of joining to suit the local conditions from time to time.

The plough is also used for *rabi* sowing of wheat, gram, etc., and sometimes for harvesting of potatoes, sweet potatoes and groundnuts.

MATERIALS USED IN THE CONSTRUCTION OF PLOUGHS

The shoe and body of a plough are generally prepared from 'Babul' (*Acacia arabica*). Sometimes they are prepared from 'Shisham' (*Dalbergia sissoo*) when both strength and weight are required. Beam is generally prepared from teak (*Tectona grandis*), 'Sal' and occasionally from 'Babul'. Plough share is prepared from mild steel bar or flat and sometimes from high carbon steel. Generally the practice is to use the wood available locally and found suitable for the purpose.

Shape. The general shape of the plough can be seen from the figures given in Section II. The indigenous plough is basically the same all over India but there may exist some difference in the size of various components.

General Construction. Every plough has a shoe, a body, a handle and a beam. There are, however, the following variations observed in the details of construction :

1. The shoe and the body are in one piece (DRG. 13) as in the case of ploughs used in Bombay Deccan, Bihar, West Bengal, Travancore-Cochin, Madras and Coorg. This construction is adopted mainly in the rocky regions where gravelly soils with stones and other obstacles are generally encountered during the course of ploughing. A joint between the shoe and the body seems to have been purposely avoided with a view to make the plough rigid and robust. The handle is a separate attachment to the plough body and a certain amount of flexibility is considered desirable in the handle to avoid shocks or jerks to the hand.

2. The body and the shoe are separate parts, (DRG. 4, Plate 4). This design seems to have been particularly preferred in the regions having alluvial soils with greater proportion of sand. Due to abrasive action of the sand particles, the share wears out quickly. The type of construction facilitates the replacement of the shoe only whenever required. To save wear and tear on the body, the width of the shoe at the joint with the body is always more than the body width.

3. Curved or bent beams, are provided in heavy types of ploughs which require more than one pair of bullocks for operation. This shape of the beam seems to have been adopted to permit the adjustment of the working angle for controlling ploughing depth, by comparatively small movement of the yoke on the beam.

4. In some ploughs, the joint of the beam is just at the point where the shoe piece is attached to the body (DRG. 13 Plate 22) while in some cases the joint of the beam is at a higher place in the body (Plate 12). Where the joint is at a higher place, more clearance space is available under the beam for easily passing over the clods and stubbles. This type of joint enables the beam to achieve a more horizontal position, and thereby utilizes the power of the bullocks more efficiently. This, however, puts more strain on the joint of the shoe-piece due to greater bending moment. This type of plough having a higher joint seems to be a characteristic of Panchmahal district of Bombay and parts of Madhya Pradesh where bullocks are short in stature.

Shoe. Shoes of different shapes and sizes are used in the ploughs. For general ploughing in drylands shoes are of triangular cross section, while in wetland for paddy cultivation they have more flat sections (DRG. 8).

In the State of Punjab, Uttar Pradesh, Bihar and some parts of

Rajasthan, the shoes are sturdy and long, and provide for a greater depth of ploughing.

In hilly tracts, the ploughs have long and narrow shoes fitted at an angle to have shallow ploughing.

Where body and shoe are separate pieces, the joint between these two is of oblique mortice and tenon type, and the joint is tightened by means of wedges. By this method, it is possible to change the angle between the body and shoe within limits.

From the drawings received from various States, it is observed that the inside angle between shoe and body varies from 116° to 160°. The length of the shoe piece without mortice joint varies from 1½ feet to 3 feet, width from 3 inches to 9 inches and thickness from 2 to 5¼ inches.

Share. The working angle of the share to the ground varies from 10° to 30°. Where shoe is separate from the body, the share is prepared from a square mild steel bar 2 feet to 3 feet and 9 inches long, and 5.8 inches to 7.8 inches in width. One end of the share is drawn down to a point for easy penetration into the soil. The share is generally held on the shoe by means of U shaped or ring shaped clamps. The share point projects over the shoe by 3 inches to 4 inches.

The tang or shank of the share in some designs (notably in Gujerat and Rajasthan) passes through a slot specially provided in the body (DRG. 17). The shank is kept tight with the body by means of a wedge. When the plough is in working position, the share is held in position and remains tight over the shoe automatically by soil pressure. For this reason, in such designs, no special arrangement is provided for clamping the share on to the shoe, except a small slot on the nose of the shoe piece.

In the design, where body and shoe form one piece, instead of a square bar, flat iron bar shaped at one end like a spearhead is used as the share. This type of share is fixed to the shoe by means of nails.

Handle. The handle is provided separately only in those ploughs where shoe and body are prepared from one homogeneous piece of wood. In this case, the handle is 2 feet and 6 inches to 3 feet and 2 inches long, 2 to 3 inches thick and 3 to 5 inches wide. A slot is provided at the bottom of the handle so that it can be fitted loose over the protruding mortised end of the beam which passes through the body. This method is specially followed in the Bombay Deccan.

In other types, the handle is separately fixed to the body by means of nails and a lap joint.

Beam. The length of beams generally varies from 9 to 15 feet and section from $2\frac{1}{2}$ inches $\times$ 3 inches to 4 inches $\times$ 9 inches according to medium or heavy duties for which the plough is designed.

One end of the beam is fixed to the body by means of mortice and tenon joint. A wooden pin is also inserted through a hole drilled at the mortised end to avoid slipping off during operations. At the other end of the beam, notches or holes to admit wooden or M.S. pins, are provided so as to facilitate easy yoking of bullocks, at a suitable point, according to the height of bullocks.

In the Melur type of plough used in Madras a cast iron shoe of special shape is used.

THE MELUR PLOUGH

The Melur plough (Madurai District) is named after its place of manufacture and its design is reported to have been copied from a Burmese pattern (DRG. 11, Plate 19). The frame work resembles that of a country plough with the difference that the shoe is a renewable cast iron piece. The curved cast iron piece is slipped over the nose of the shoe, and the top of the cast iron shoe is kept in position by a pivoted stud fixed to the shaft rest. The face of the shoe is ribbed for strength. The shoe lasts for about 2 to 3 years.

Another interesting plough is the Mannargudi plough (Tanjore District) the body of which is (Plate 17) entirely of steel.

Mannargudi Plough (Plate 17) is named after its place of manufacture. This is an indigenous iron plough with a long shaft. The combined steel share and shoe is fabricated from mild steel plates $\frac{1}{4}$ inch thick and differs from that of the country plough in that the section is inverted and wedge shaped.

Method of Hitching. The ploughs are worked generally with a pair of bullocks. The beam of plough is hitched to the yoke. For proper hitching, the yoke is generally provided with a groove or notch or both in the centre. The beam is also provided with either a bolt or movable pegs or grooves.

A short thick strong rope is used for tying the beam to the yoke. A special type of knot is used for tying purposes so that it can be tied and untied easily. The yoke is a single type one if the draft is light, otherwise a double yoke is used ; specially so when more than one pair of bullocks are used. The bullocks are tied at the ends, while the beam comes in the centre of the yoke. There are special yoking straps or ropes which are used for tying the bullocks to the yoke. There are two wooden or iron standards inserted through the holes provided in the yoke at suitable spacing. The yoke rests on the neck of the bullocks.

In South and Central India where the ploughing is to be done in rocky soils, the hitching is done with a long thick rope which braces both the body of the plough and the yoking point of the beam (Plate 6). This bracing is done in such a way that the entire pull is taken up by the rope eliminating the strain on the beam and beam joints. When more than one pair of bullocks is required, double yokes are used for yoking each pair.

Method of Operation. The plough is hitched to the yoke with the help of the beam and ropes. The ploughman controls the plough with one hand and drives the animals with the other. The plough can be set for deeper ploughing by increasing the angle between the beam and the shoe-piece. The depth of penetration can also be adjusted by changing the distance of the yoking point on the beam. The longer the distance, the deeper will be the ploughing.

Laying Out of the Land. Several methods in laying out the furrows are in vogue. Generally, two methods appear to be popular. In one method, a furrow is opened from a suitable point of the field and the second one is taken at a convenient distance. The ploughman then goes round and round these furrows till the strip in between is completely ploughed. He then opens another new furrow at another point in the field, and repeats the process.

In the second method after reaching the end of the first furrow, the bullocks are turned back and the second furrow is taken adjacent to the first furrow. The process is repeated till the whole field is covered.

METHOD OF TRANSPORTATION OF PLOUGHS FROM FARMSTEAD TO THE FIELD AND BACK

For transportation the plough body is placed on the yoke allowing the beam to trail on the ground. In some places, the farmers use wheeled carriers or sometime 'V' shaped carriers or the regular cart for this purpose. Light ploughs specially in hilly tracts are carried on shoulders.

Weight of the Ploughs. The weight of the plough varies from 15 lb. in the case of a manually operated type to 135 lb. in case of heavy ones requiring animal draft. Heavy indigenous ploughs are becoming obsolete and are being gradually replaced by mould board ploughs which give better quality of work.

Draft, Working Speed and Out-turn. The speed and the draft capacity of the animals vary from tract to tract depending upon the breed of the animals available locally and the standard of the maintenance of the animals by the owners. Though the bullocks are supposed to take draft to one tenth of their body weight they are

capabale of taking for short time overloads two to three times the normal draft.

The output of work in the first ploughing with a country plough in a day of 8 hours varies from 0.25 acres to 1 acre, depending upon the local soil, climatic and other conditions.

STRAIN ON THE PLOUGHMAN. Ploughing is a hard work both for bullocks as well as for the ploughman. Assuming that the average furrow width is 5 inches and assuming that no gap is left between two furrows, the ploughman will have to walk at least about 20 miles per day to cover an acre.

LIFE OF PLOUGH. Life of an implement depends upon the type of materials used in the construction and the usage to which it is put. It also depends upon the care taken in maintenance and storage. Taking all the factors into consideration, the life of an implement may be taken from 2 years to 10 years. Frequency of repairs depends upon the working and soil conditions. The average cost of annual repairs normally varies from Rs. -/8/- to Rs. 6/-/-.

MANUFACTURE. The ploughs and other indigenous agricultural implements are manufactured by village artisans. The farmers generally supply the raw materials. There being no standardisation, mass production on large scale has not been attempted.

Cost of Ploughing. As all agricultural operations require a pair of bullocks for operating the implements, the cost of ploughing and other operations is mainly due to the cost of maintenance of animals. On general analysis, it is revealed that out of the total cost the farmer has to bear for these operations, the bulk of the cost is mainly for the maintenance of the bullocks. The cost of plough designed for use with a pair of bullocks varies from Rs. 6/- to Rs. 40/-. Taking an average cost of Rs. 20/- the working cost of this implement for a year will be as follows, taking Uttar Pradesh conditions.

Repairs and replacement of the wearing parts	Rs.	4.00
Depreciation and interest at 24 per cent (Depreciation 20 per cent, interest 4 per cent) of the capital assuming that the life of the plough is 5 years	Rs.	4.80
Total	Rs.	8.80

The annual cost of maintenance of a bullock varies from Rs. 600/- to Rs. 1,000/-. Assuming the average cost of maintaining a pair of bullocks is Rs. 1,500/- and the number of days bullocks can be used as 300 the cost of maintaining a pair of bullocks per working day will amount to Rs. 5/-.

Presuming that ploughing is done for about 50 days in a year, the following will be the yearly expenditure for ploughing :

Ploughing 50×5	Rs.	250.00
Maintenance of the plough	Rs.	8.80
Total	Rs.	258.80
	Rs.	259.00 approx.

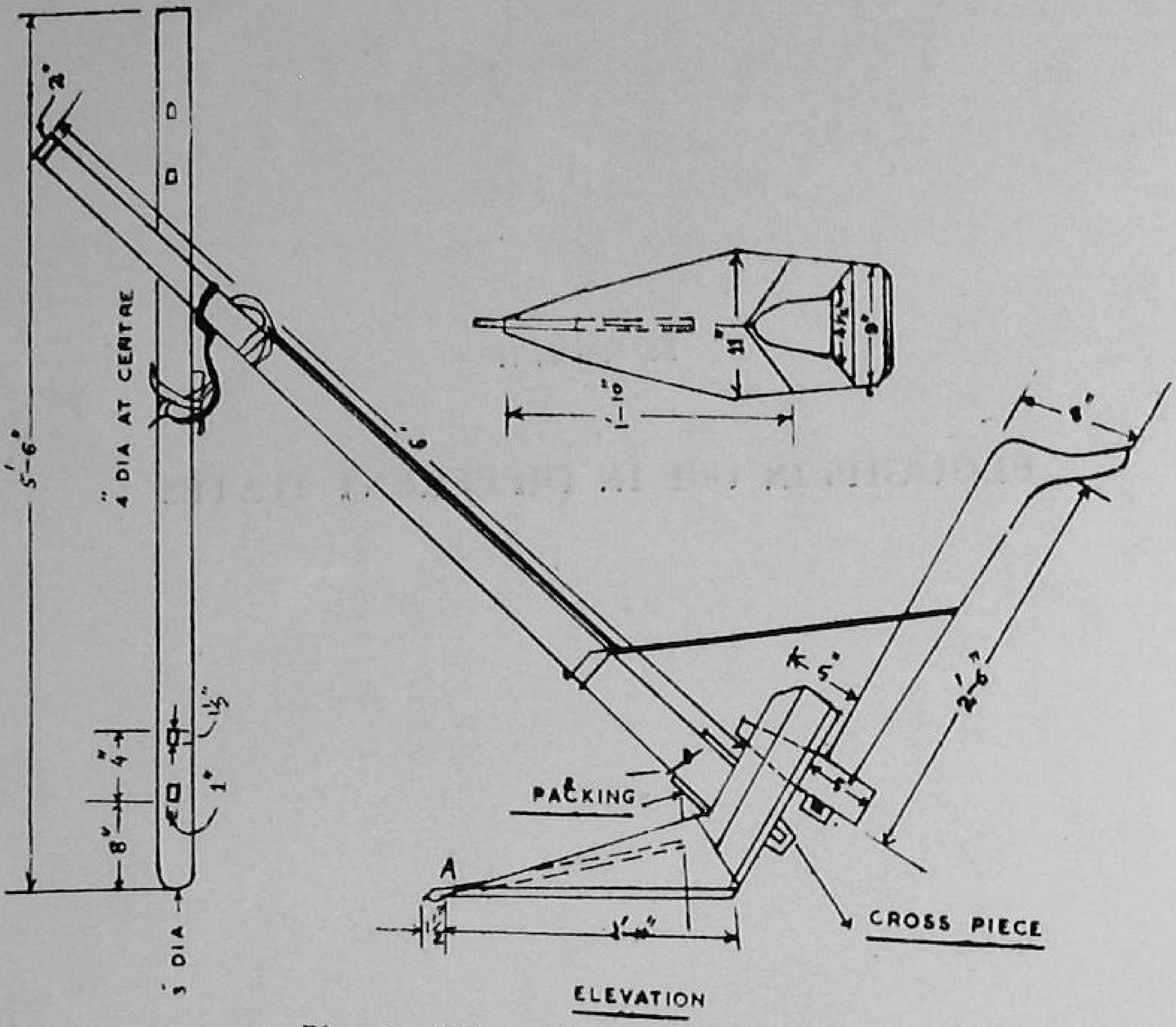
The above figures indicate that out of the total cost of Rs 259/- hardly Rs. 9/- i.e., 3.5 per cent is for the implement.

Details of the ploughs in vogue in various States are given in the following pages.

SECTION II

PLOUGHS IN USE IN DIFFERENT STATES

PLATE 1



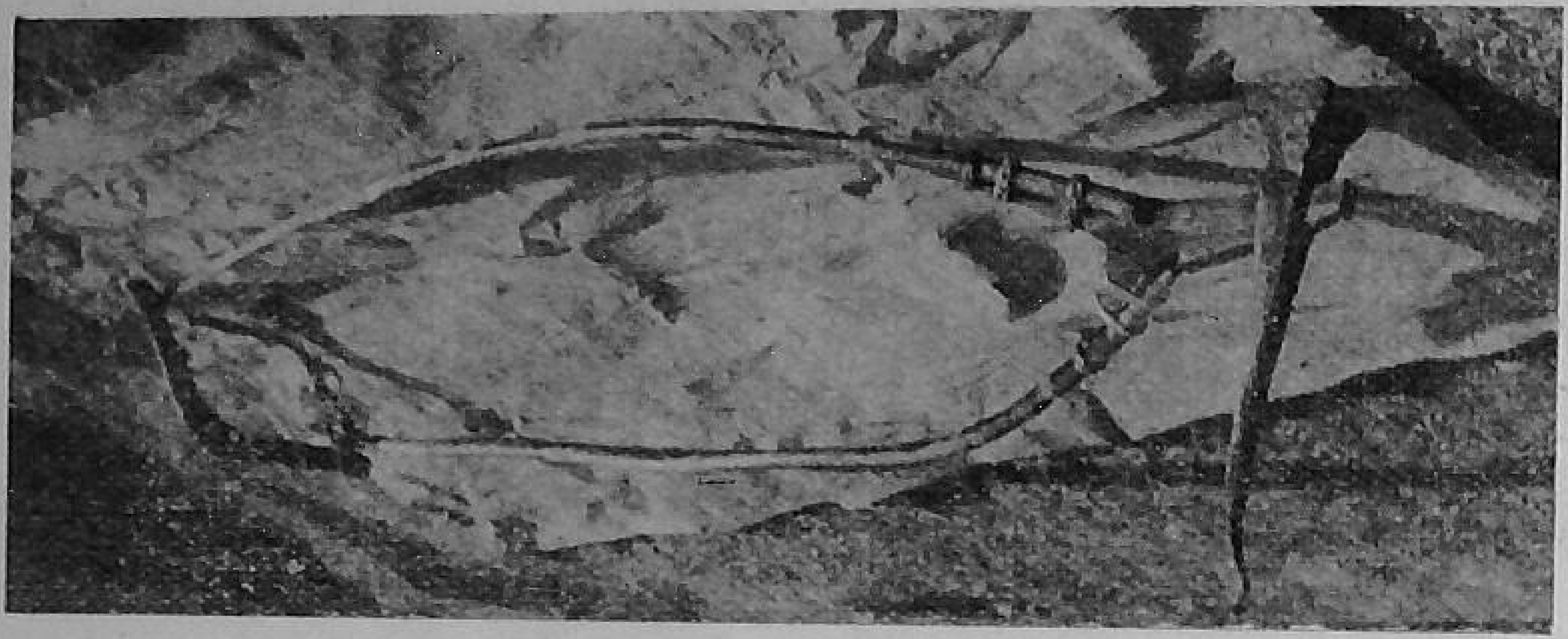
Plough (Guntur) Andhra Pradesh

PLOUGHS

Demmu Nagali—Plough (Andhra Pradesh)

1.	Classification	Land preparation implement
2.	Name (English and local)	Wet land plough-Demmu Nagali
3.	Name of the State and District	Andhra—Guntur, West Godavari
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Babul, Palmyrah and mild steel
6.	Weight of the implement	30—40 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two buffaloes or bullocks and one man
8.	Cost	Rs. 7 to 10
9.	Service life	2—3 years
10.	Usage	Used for puddling purposes
11.	Method of application	The plough is hitched to the yoke by means of ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 0.50 to 1
14.	Work rate	½ acre per day
15.	Cost of operation per acre	Rs. 10
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	
18.	Total number of working days in a year	
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	The average draft ranges from 200-220 lb. The depth of ploughing in black and red soils varies from 4—5 inches and width from 5—6 inches

PLATE 2



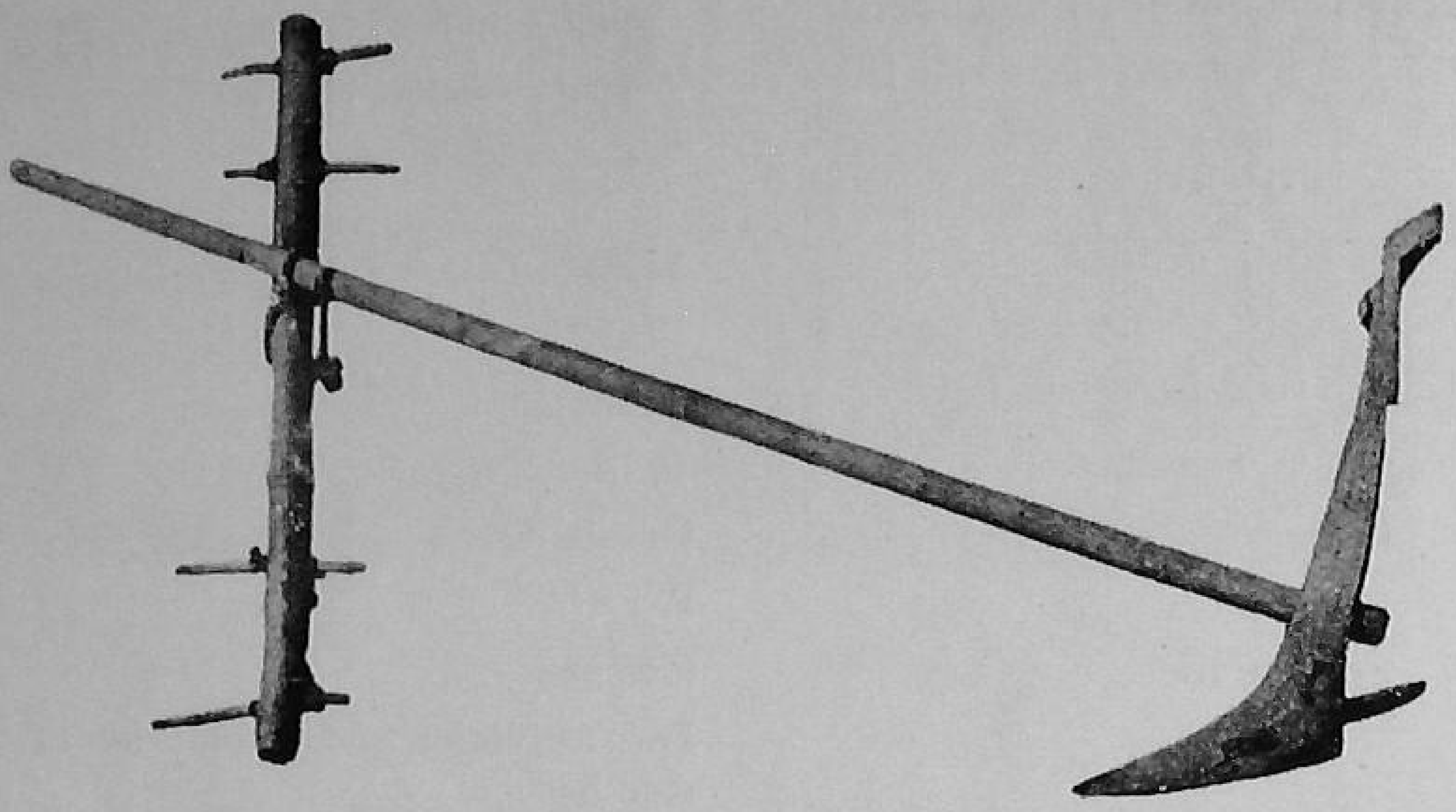
Plough (Cachar) Assam

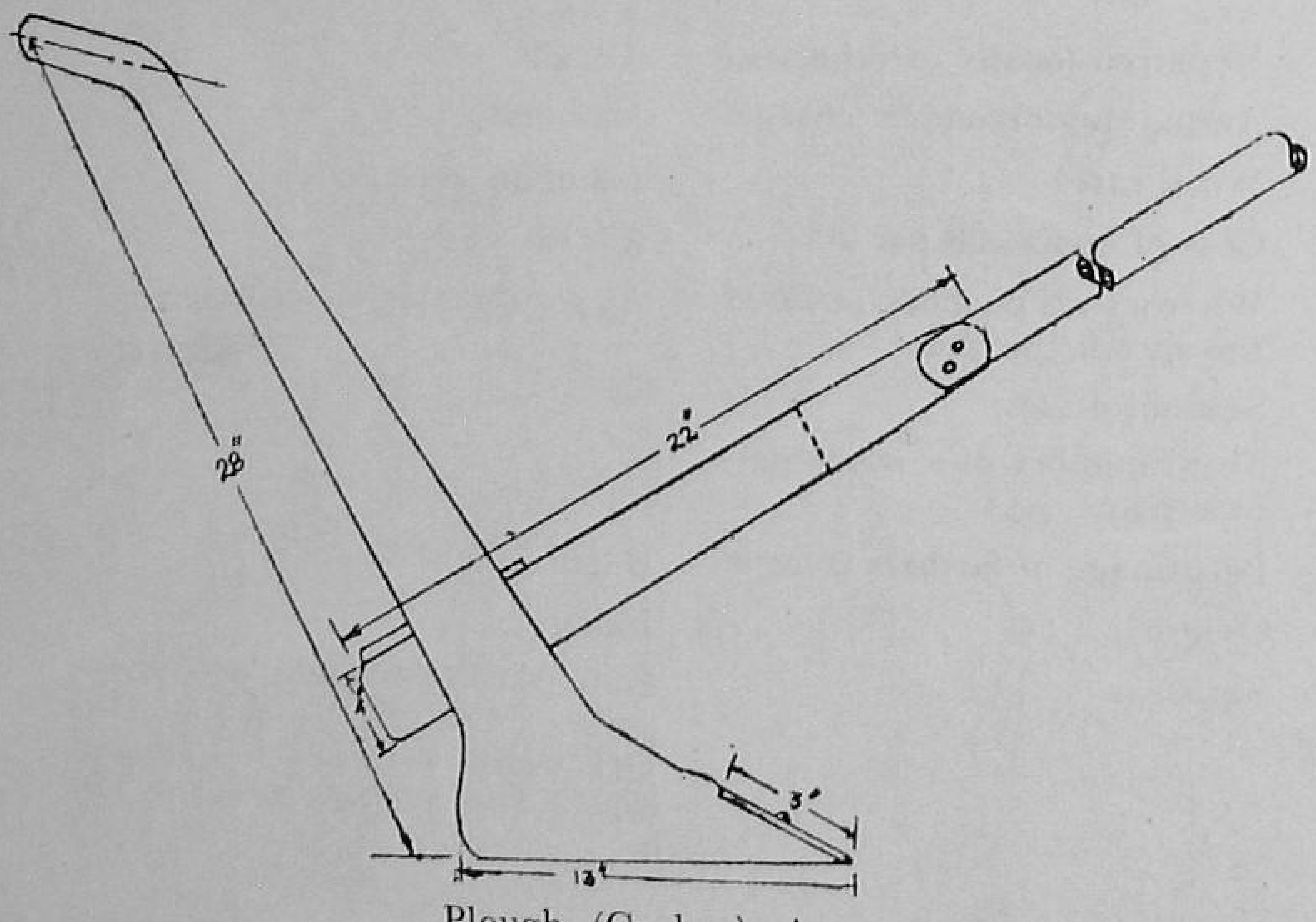
PLOUGHS

Langal or Nangal—Plough (Assam)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plough—Langal or Nangal
3.	Name of the State and District	Assam—Cachar District
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Mango, Palm wood and mild steel
6.	Weight of the implement	19½ lb.
	(i) Iron part	½ lb.
	(ii) Wooden part	19 lb.
7.	Operating power	One buffalo and one man
8.	Cost	Rs. 8
9.	Service life	One year
10.	Usage	For cultivation and preparation of seed bed
11.	Method of application	The implement is attached to a special type of yoke by means of a rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	1/3 of an acre per day
15.	Cost of operation per acre	Rs. 12
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	20 per cent
20.	Origin	Indian
21.	Remarks	Body, shoe and handle are in one piece. Average depth is 3 inches and width 4 inches in alluvial soils. The average draft is 120 lb.

PLATE 3





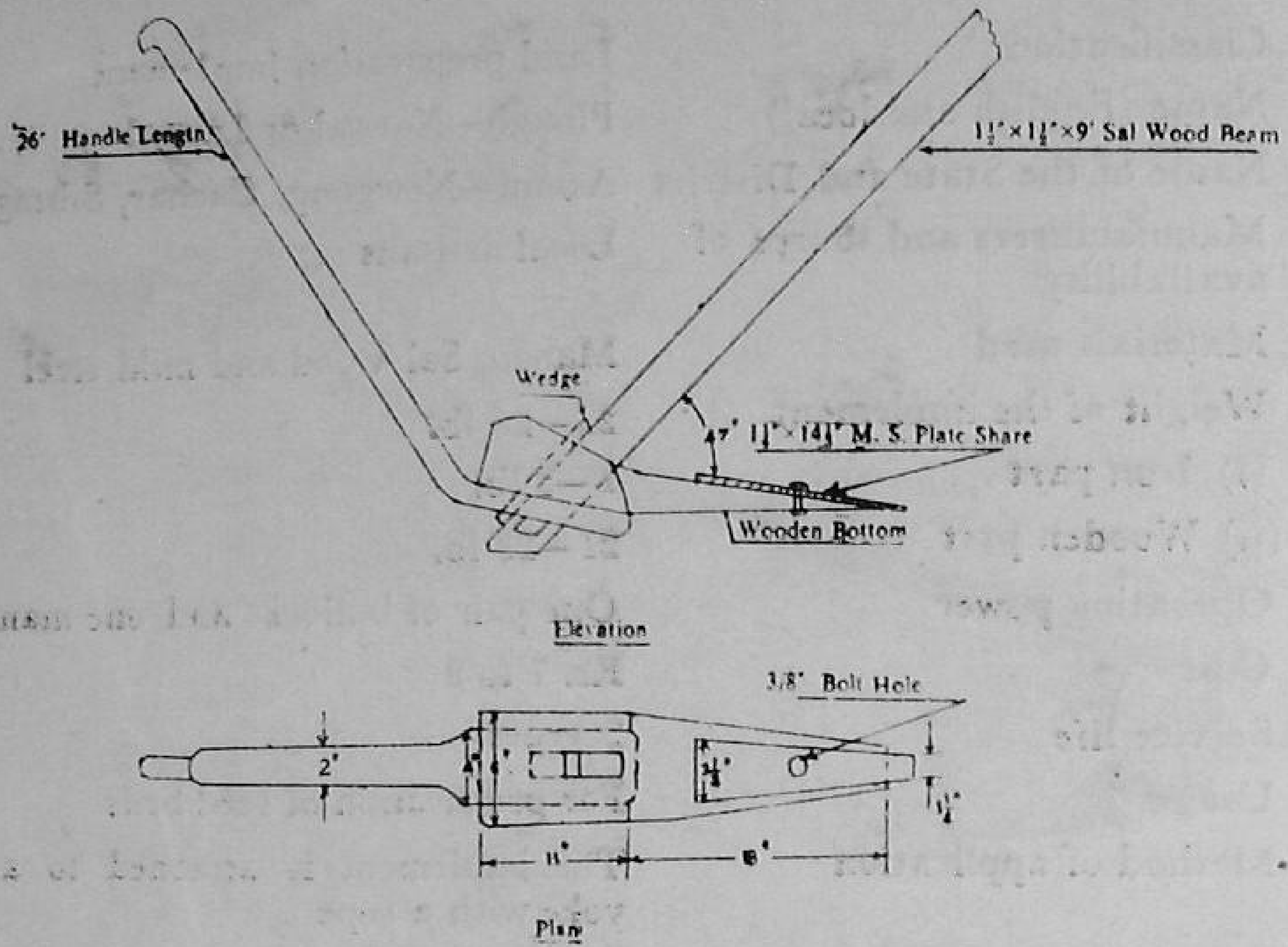
Plough (Cachar) Assam

PLOUGHS

Nangal or Langal Plough (Assam)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plough—Nangal or Langal
3.	Name of the State and District	Assam—Nowgong, Cachar, Sibsagar
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Mango, Sal wood and mild steel
6.	Weight of the implement	22—25 lb.
	(i) Iron part	1—2 lb.
	(ii) Wooden part	21—23 lb.
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 7 to 9
9.	Service life	2 years
10.	Usage	For preparation of seed beds
11.	Method of application	The implement is attached to a yoke with a rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	0.3 acre per day
15.	Cost of operation per acre	Rs. 12 to 15
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	In paddy sowing season
18.	Total number of working days in a year.	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	Body, shoe and handle are prepared from one piece. Average depth is 3 inches and width is 4 inches in alluvial soils. The draft is 100-120 lb. on an average.

PLATE 4

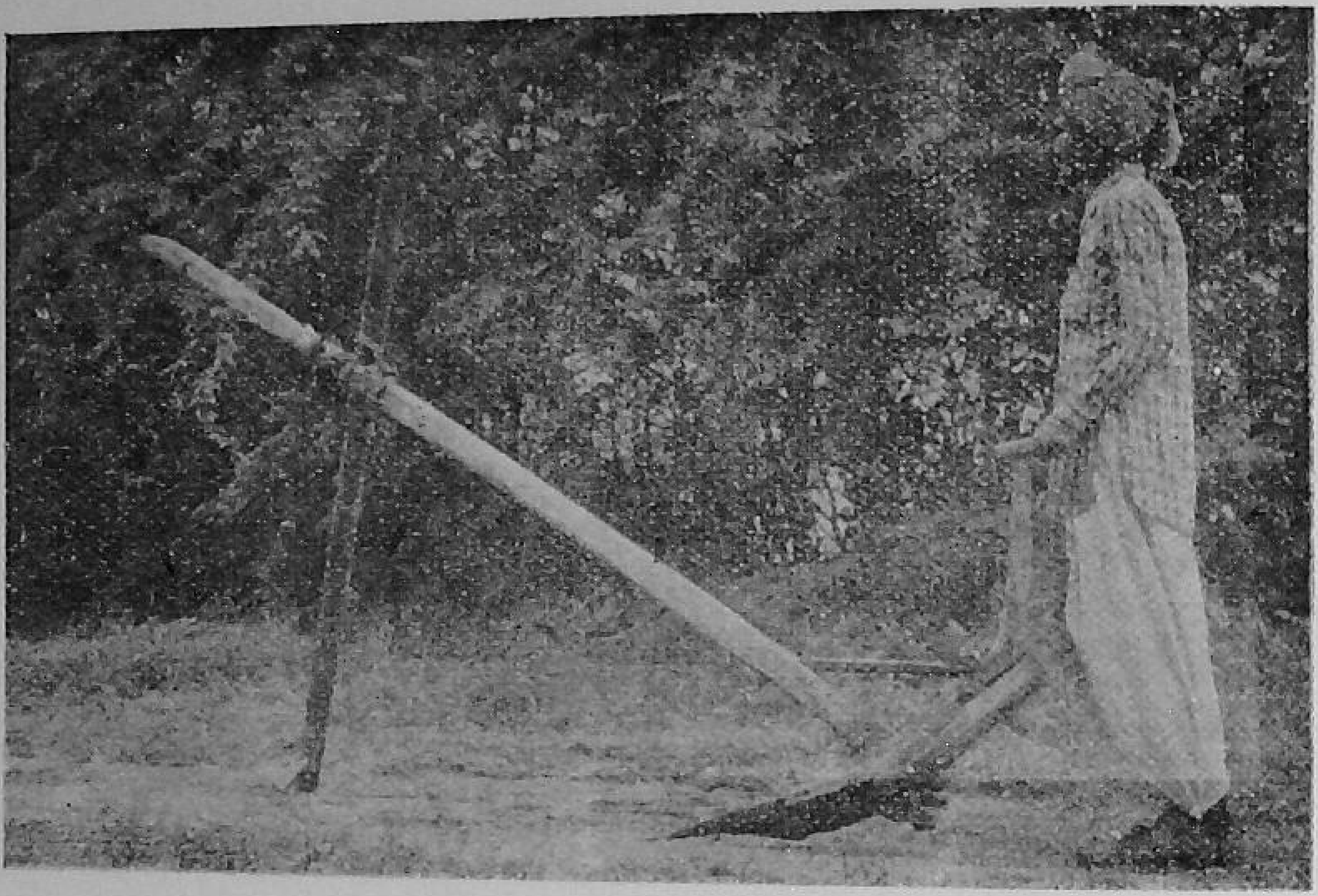


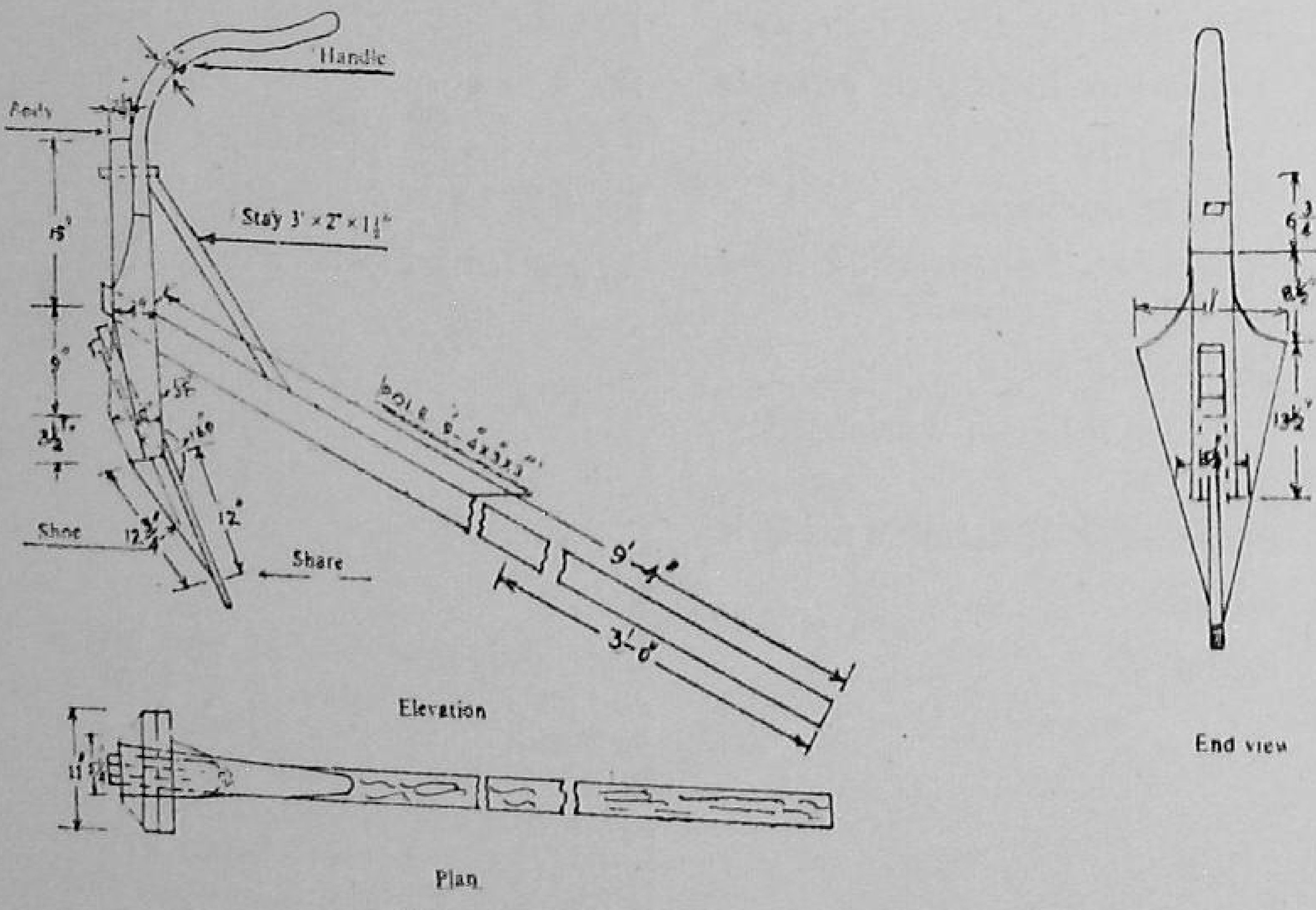
Plough (Champaran) Bihar

PLOUGHS

Desi Plough (Bihar)

1.	Classification	Land preparation implement
2.	Name (English and local)	Country plough – Desi Hal
3.	Name of the State and District	Bihar—Champaran, Purnea, Santhal Parganas
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Bamboo, Babul, Sal wood and mild steel
6.	Weight of the implement	25-40 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One pair of bullocks and one person
8.	Cost	Rs. 7 to 13
9.	Service life	1-2 years
10.	Usage	For preparation of seed bed. It is generally used for paddy land cultivation
11.	Method of application	The beam of the plough is fixed to a yoke by ropes, etc.
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 3 to 4
14.	Work rate	0.26 to 0.4 acre per day
15.	Cost of operation per acre	Rs. 8 to 12
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	Body and shoe are in one piece and handle is separate and bent forward. Average depth is 2-4 inches and width 4-5 inches, depending upon soil conditions. This type of plough is also found in use in Trichur, Quilon, Kottayam and Trivandrum Districts of Travancore-Cochin.



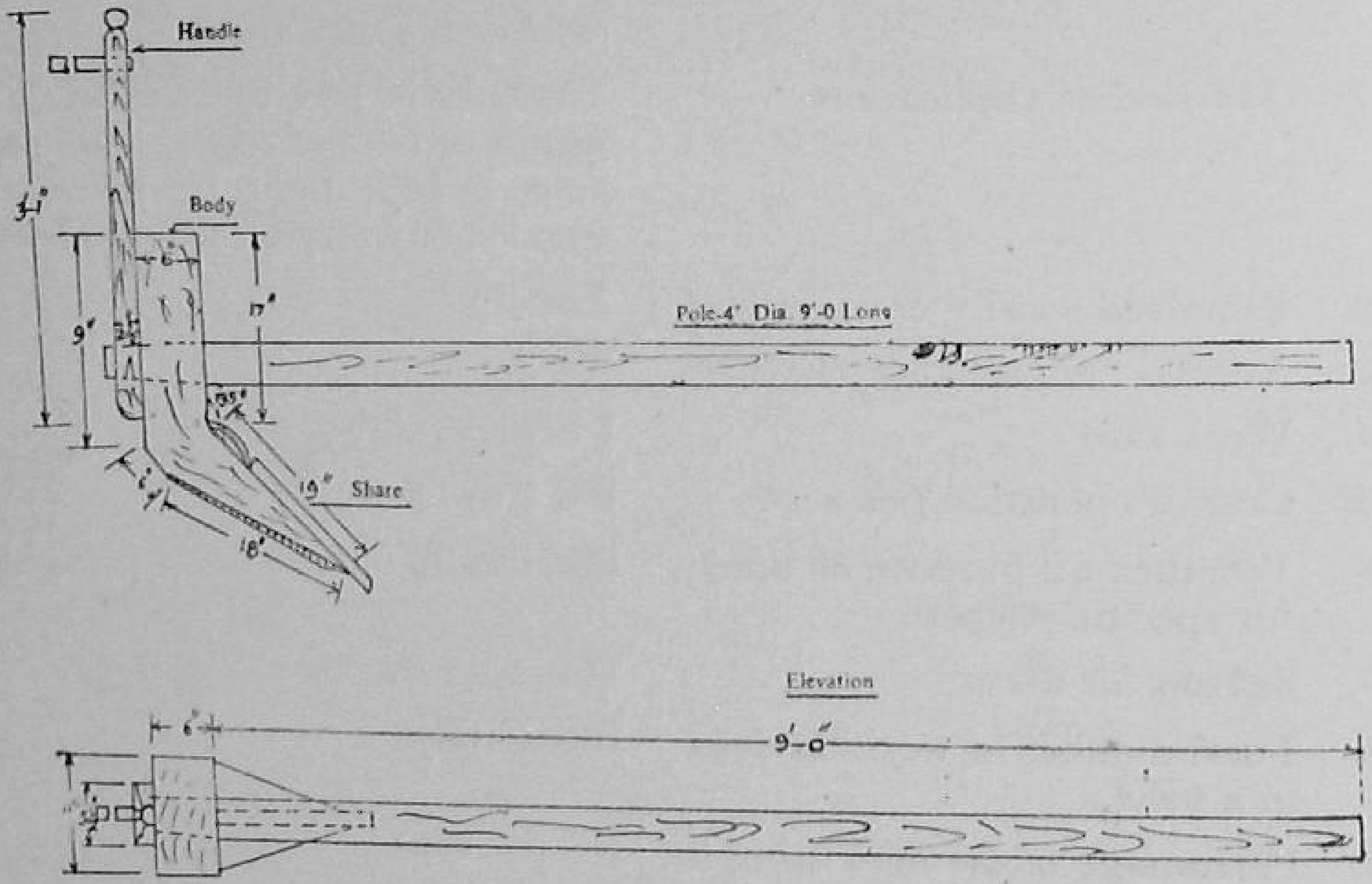


Plough (Kaira) Bombay

PLOUGHS

Hal (Bombay)

1.	Classification	Land preparation implement
2.	Name (English and local)	Country plough—Hal
3.	Name of the State and District	Bombay—Banas Kantha, Mehsana, Kaira
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Babul, Dhawad and teak wood and mild steel
6.	Weight of the implement	45—56 lb.
	(i) Iron part	3—4 lb.
	(ii) Wooden part	42—52 lb.
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 15 to 20
9.	Service life	5–10 years
10.	Usage	It is used for preparing seed bed for *Bajri*, *Jowar* and Maize
11.	Method of application	The yoke is tied to the beam by means of loop of rope. The rope loop is kept tight by means of wooden or iron pegs fixed to beam.
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 3
14.	Work rate	1 acre per day
15.	Cost of operation per acre	Rs. 7 to 11
16.	Whether all purpose or used for specific purpose	Specifically for monsoon ploughing
17.	Season for use	Monsoon season
18.	Total number of working days in a year.	10—40 days
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	Handle, body and shoe are in separate pieces. The average draft is about 150 lb.



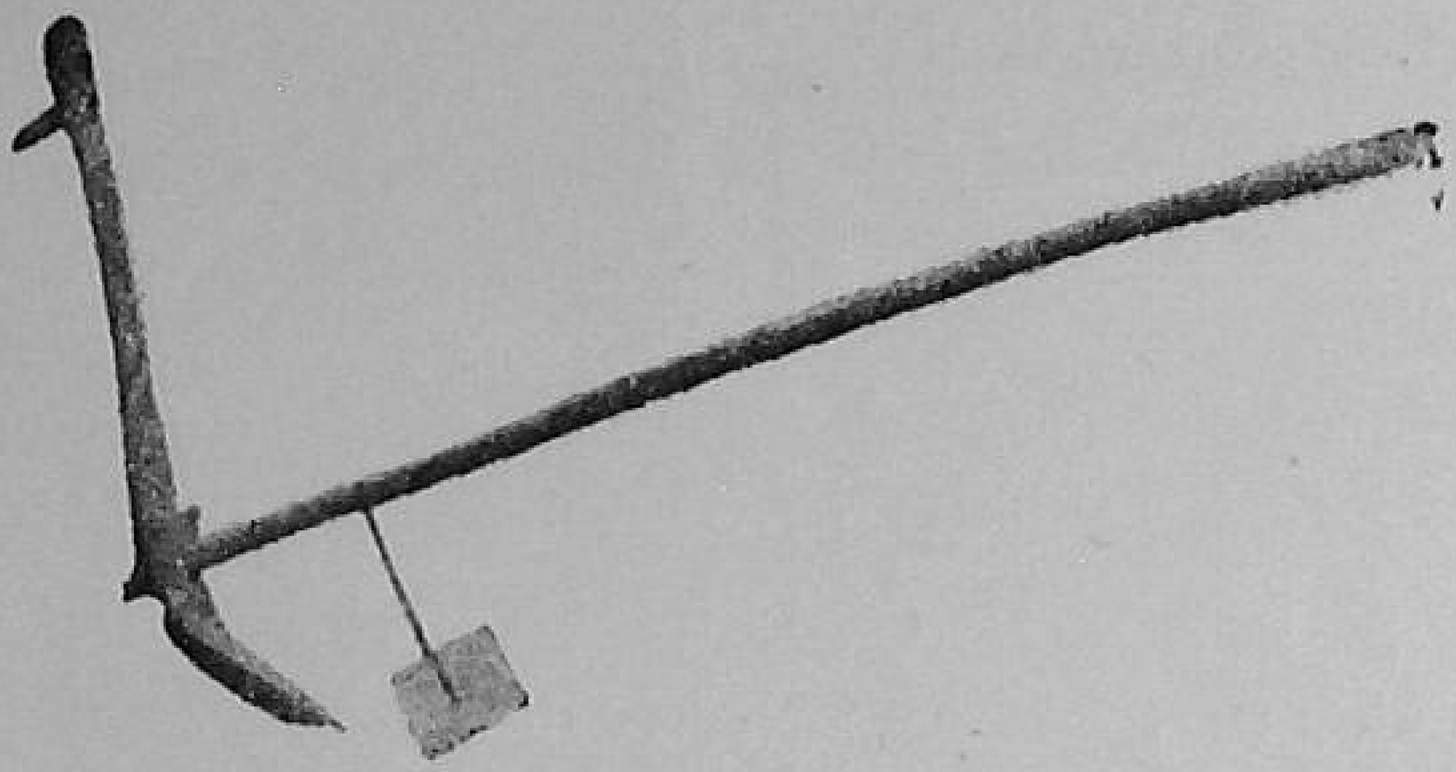
Plough (East Khandesh) Bombay

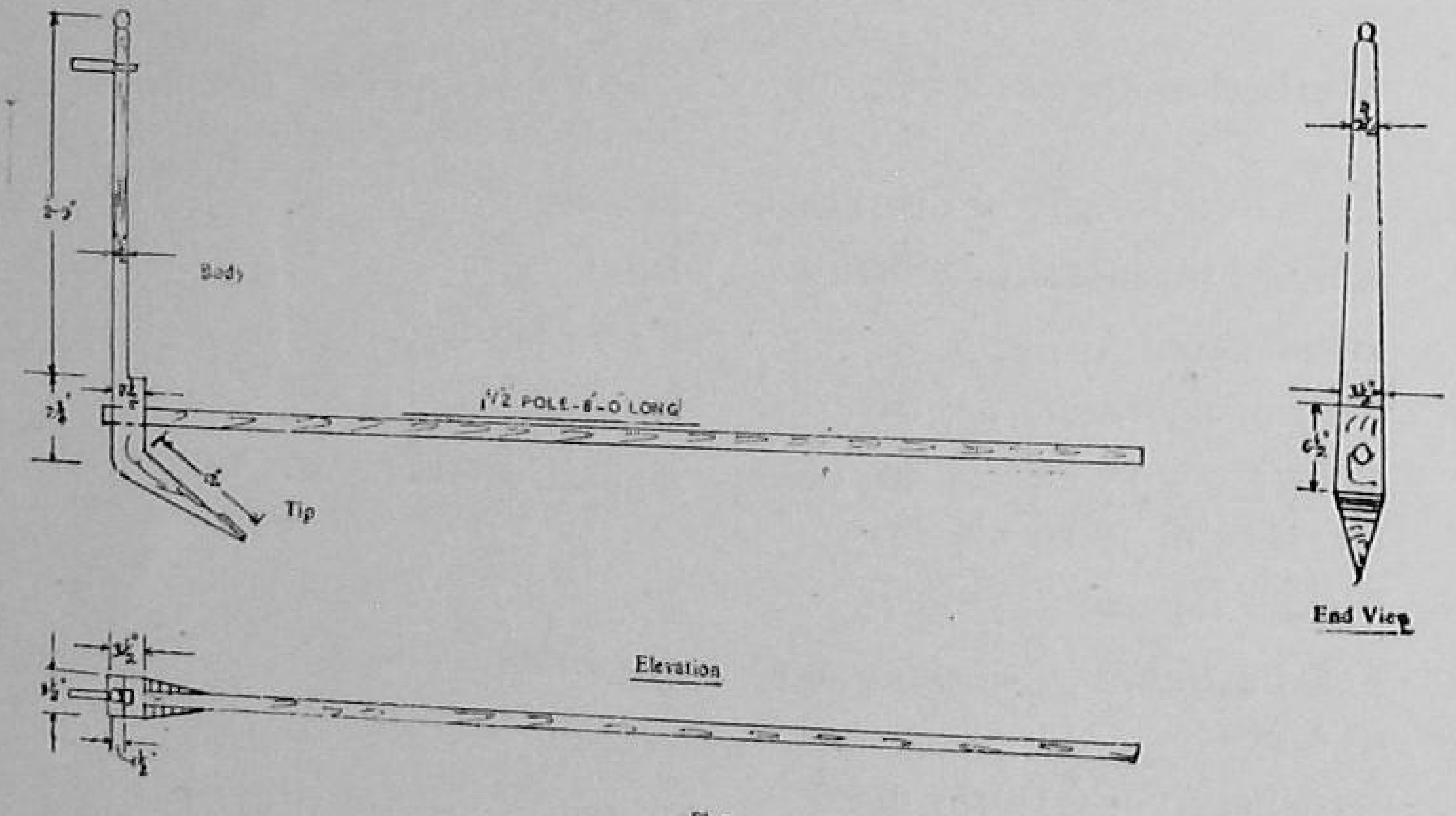
PLOUGHS

Country Plough—Nangar (Bombay)

1.	Classification	Land preparation implement
2.	Name (English and local)	Country plough—Nagar (Marathi)
3.	Name of the State and District	Bombay—East Khandesh
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Babul, Sal and mild steel
6.	Weight of the implement	112 lb.
	(i) Iron part	12 lb.
	(ii) Wooden part	100 lb.
7.	Operating power	One pair of bullocks and one person
8.	Cost	Rs. 20
9.	Service life	5 years
10.	Usage	For preparing seed beds of various crops
11.	Method of application	The yoke is tied to the beam by means of rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 1
14.	Work rate	1 acre per day
15.	Cost of operation per acre	Rs. 3.75
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season for use	—
18.	Total number of working days in a year	6 to 10 days
19.	Percentage of farmers using it	—
20.	Origin	Indian
21.	Remarks	The body and shoe are in one unit and handle is separate. This plough is operated by double yoke. It is a heavy type plough. The average draft is 308 lb. in medium black soil. The width and depth of ploughing 10 inches and 5 inches respectively.

PLATE 7





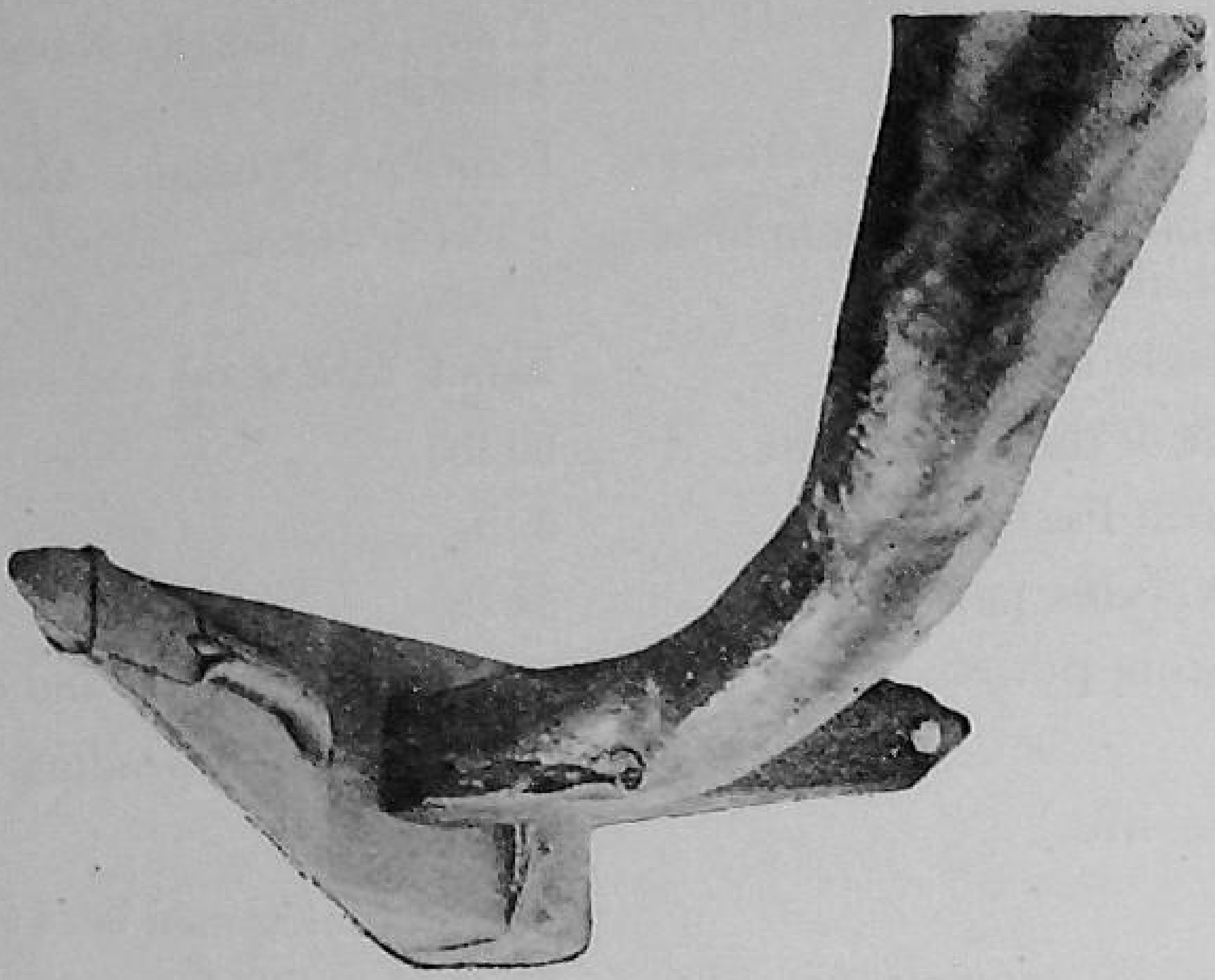
Plough (Ratnagiri) Bombay

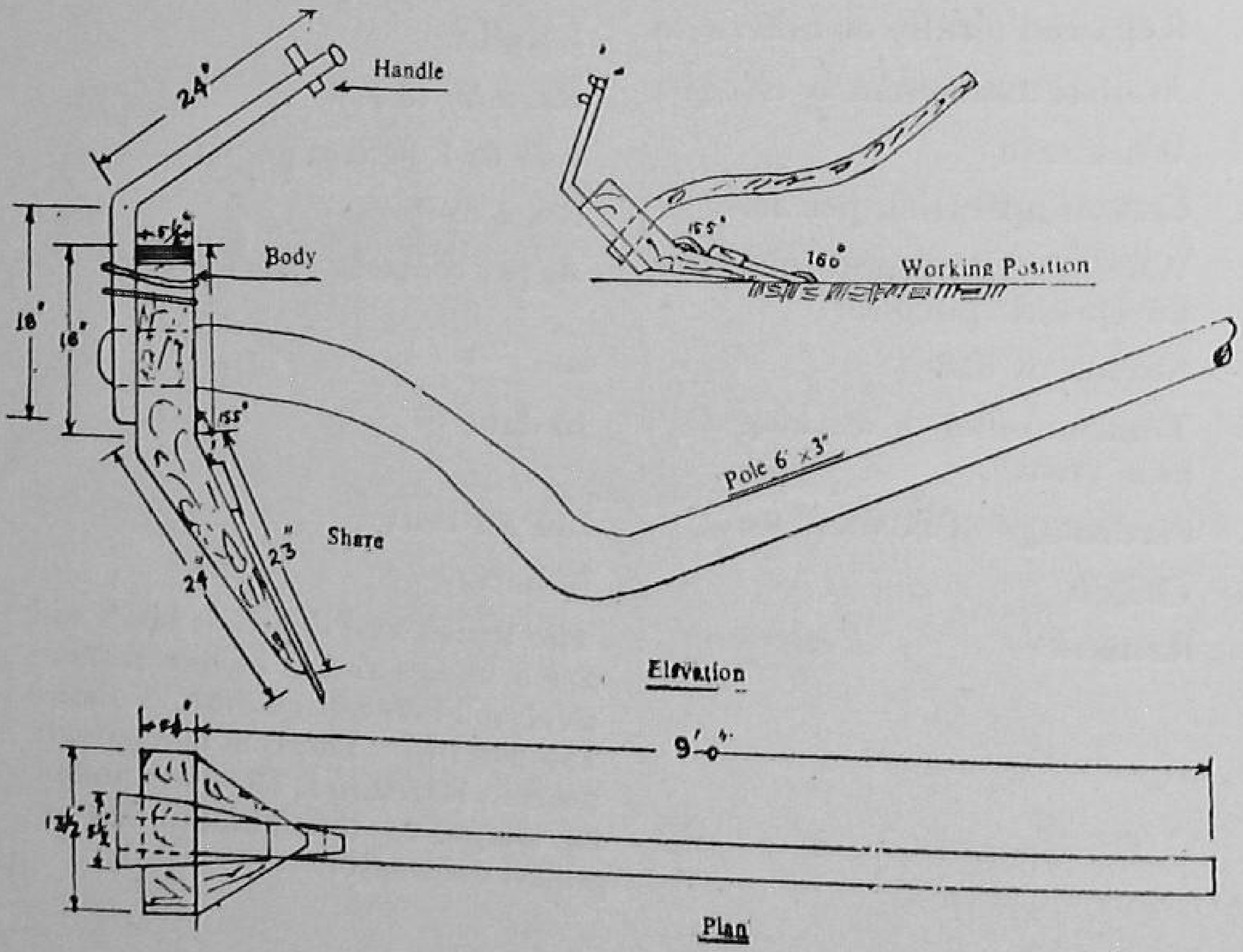
PLOUGHS

Country Plough—Nangar (Bombay)

1.	Classification	Land preparation implement
2.	Name (English and local)	Country plough—Nangar (In Marathi)
3.	Name of the State and District	Bombay—Ratnagiri, Ahmedabad
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Babul, teak wood and mild steel
6.	Weight of the implement	60 lb.
	(i) Iron Part	6 lb.
	(ii) Wooden part	54 lb.
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 12 to 30 depending on size
9.	Service life	5 years
10.	Usage	For preparing seed beds for crops
11.	Method of application	The yoke is tied to the beam by means of a rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 0.50 to 1.50
14.	Work rate	0.25 to 1.00 acre per day
15.	Cost of operation per acre	Rs. 4 to 9
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17-	Season of use	—
11.	Total number of working days in a year	10 days
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	The width and depth in black soil are 5 inches and 6 inches respectively. The average draft is about 150-209 lb. There is one plough used in Ratnagiri District similar in shape to this plough and is pulled manually.

PLATE 8





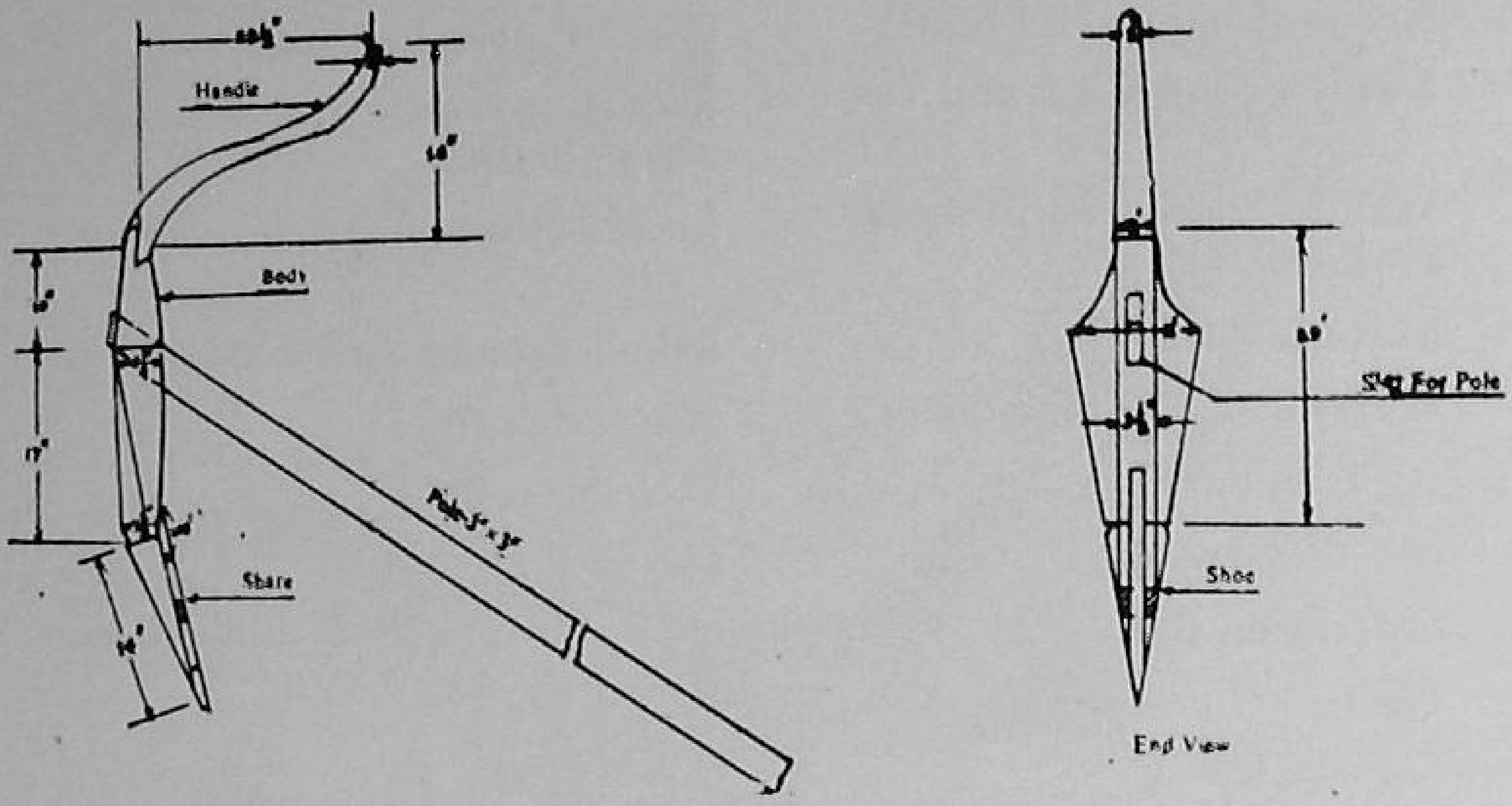
Plough (Poona) Bombay

PLOUGHS

Country Plough—Nangar (Bombay)

1.	Classification	Land preparation implement
2.	Name (English and local)	Country plough, Nangar
3.	Name of the State and District	Bombay—Poona, Ahmednagar, Nasik, Bijapur
4.	Manufacturers and source of availability	Local artisans
5.	Material used	Babul, Sal and teak wood and M.S.
6.	Weight of the implement	60—100 lb.
	(i) Iron part	2—5 lb.
	(ii) Wooden part	58—95 lb.
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 20 to 40
9.	Service life	5 years
10.	Usage	For preparing seed beds
11.	Method of application	The yoke is attached to the beam by means of rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance	Rs. 1.50
14.	Work rate	1 acre per day
15.	Cost of operation per acre	Rs. 5 to 6
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season for use	Year round
18.	Total number of working days in a year	6—12 days
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	Shoe and body are in one unit and handle is separate. Handle is bent forward. The average draft is 154 to 200 lb. The depth is 5—6 inches and width of cut is 7—10 inches.

PLATE 9

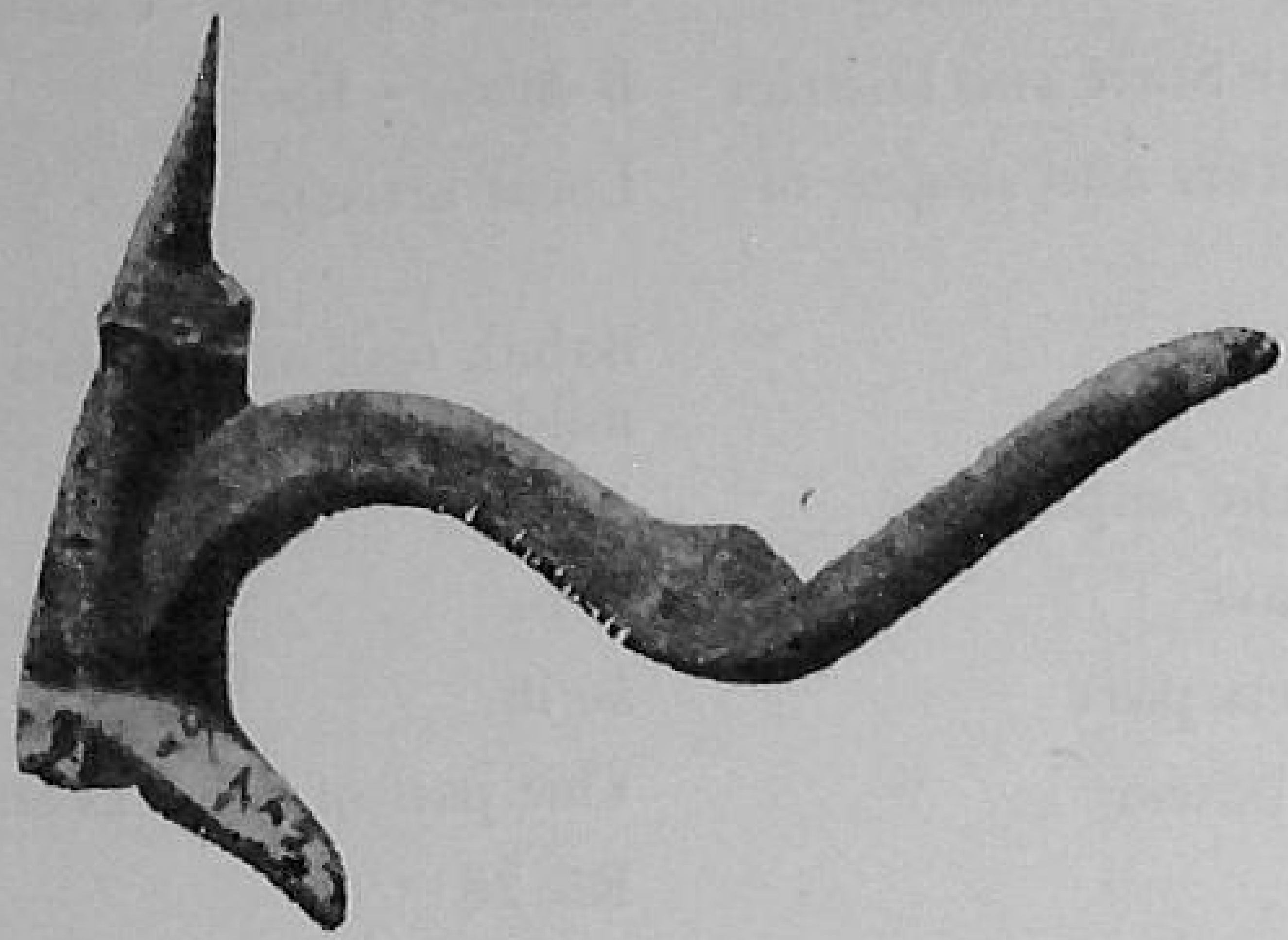


Plough (Kaira) Bombay

PLOUGHS

Charota Hal (Bombay)

1.	Classification	Land preparation implement
2.	Name (English and local)	Country plough - Charota Hal
3.	Name of the State and District	Bombay - Kaira
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Babul, teak or Dhawad wood, and mild steel
6.	Weight of the implement	54 lb.
	(i) Iron part	4 lb.
	(ii) Wooden part	50 lb.
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 25
9.	Service life	10 years
10.	Usage	It is used for preparing seed bed, for *bajri*, *kodra*, tobacco and cotton
11.	Method of application	The yoke is tied to the beam by means of rope loop and is kept tight by means of wooden or iron pegs fixed to the beam
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1.50
14.	Work rate	I acre per day
15.	Cost of operation per acre	Rs. 7.75
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	During the season of *bajri*, cotton and tobacco (In monsoon season)
18.	Total number of working days in a year.	13 days
19.	Percentage of farmers using it	100 per cent in Kaira District
20.	Origin	Indian
21.	Remarks	Handle, body and shoe are in separate pieces. The shoe which is made of steel is fixed by means of a wedge. Used specially in monsoon season.

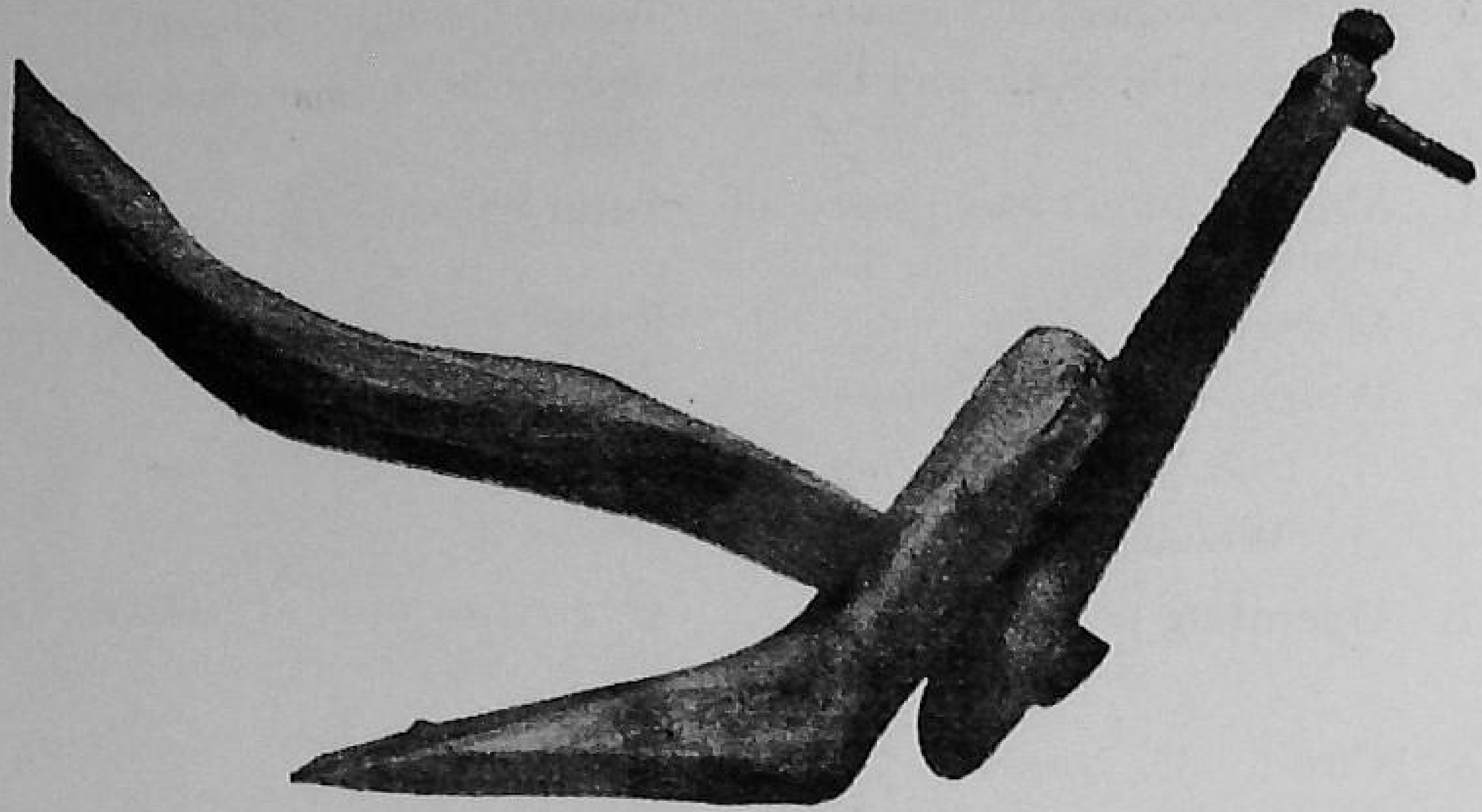


Plough (Osmanabad) Hyderabad

PLOUGHS

Wooden Plough—Nangar (Hyderabad)

1.	Classification	Land preparation implement
2.	Name (English and local)	Wooden plough - Nangar
3.	Name of the State and District	Hyderabad - Osmanabad, Aurangabad
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Babul, Teak wood and mild steel
6	Weight of the implement	90 - 95 lb.
	(i) Iron part	4 lb.
	(ii) Wooden part	80 - 91 lb.
7.	Operating power	One to two pairs of bullocks and one or two persons
8.	Cost	Rs. 15
9.	Service life	8 to 10 years
10.	Usage	For preparing seed beds
11.	Method of application	The implement is hitched to a wooden yoke by rope or chain
12.	Repaired locally or otherwise	Locally
13	Annual maintenance charges	Rs. 2 to 3
14.	Work rate	1/3 of an acre per day
15.	Cost of operation per acre	Rs. 10
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	*Kharif* and *rabi*
18.	Total number of working days in a year	—
19,	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	Body and shoe are prepared from one piece and handle is separate. The use of this plough is being gradually discarded by the cultivators. It is felt very difficult to operate this implement. The depth in black soil is 8 inches nearly.

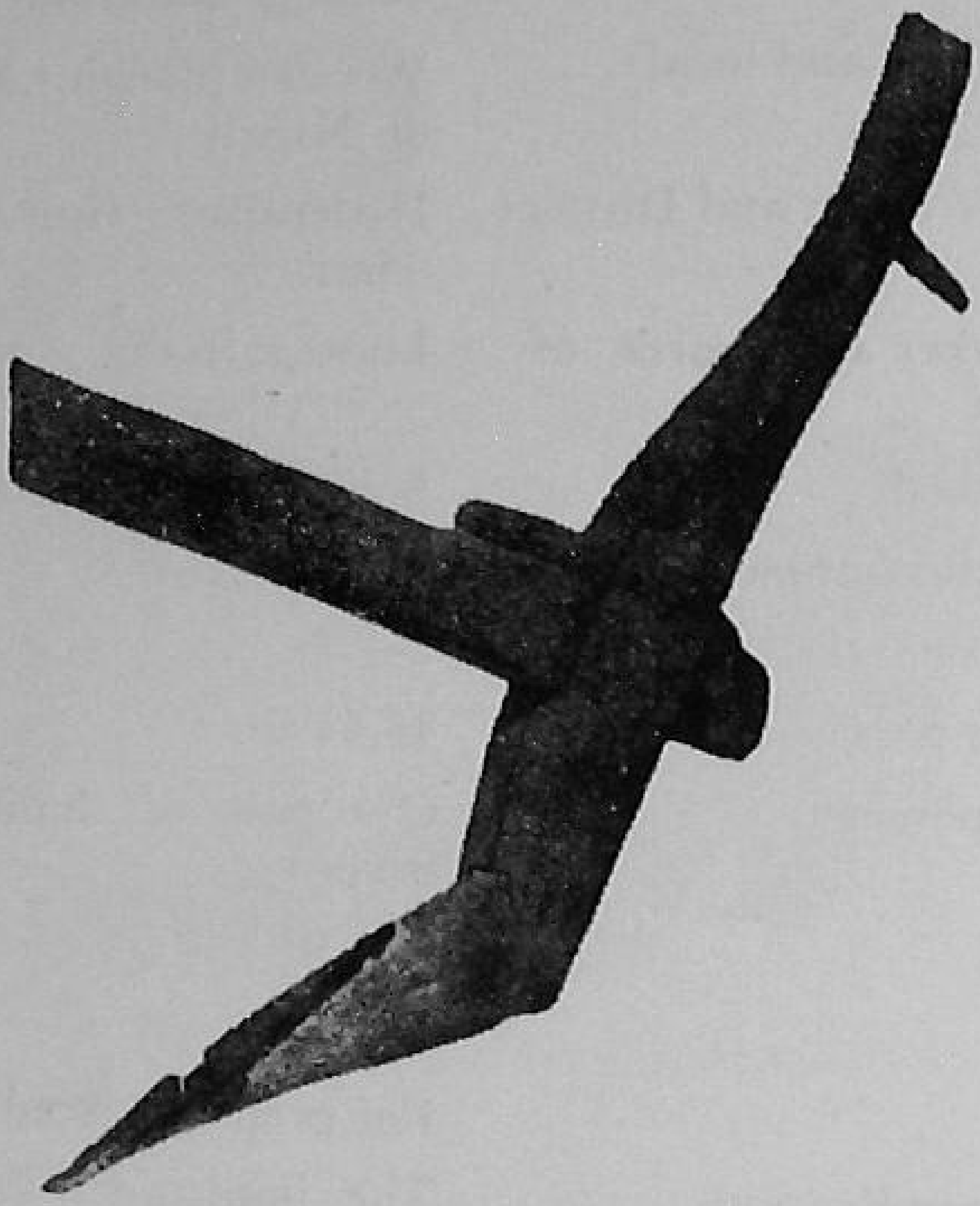


Plough (Gulbarga) Hyderabad

PLOUGHS

Wooden Plough—Rintey Madikey or Nagali (Hyderabad)

1.	Classification	Land preparation implement
2.	Name (English and local)	Wooden plough - Rintey Madikey, or Nagali
3.	Name of the State and District	Hyderabad - Gulbarga, Bidar, Rai-chur
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Babul, teak wood and mild steel
6.	Weight of the implement	48-68 lb.
	(i) Iron part	2-4 lb.
	(ii) Wooden part	46-64 lb.
7.	Operating power	One pair of bullocks and one person
8.	Cost	Rs. 10
9.	Service life	—
10.	Usage	For preparing seed beds
11.	Method of application	The implement is hitched to a wooden yoke by rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 2 to 3
14.	Work rate	0.33 - 0.5 acre per day
15.	Cost of operation per acre	Rs. 11
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	*Kharif* and *rabi*
18.	Total number of working days in a year	Year round
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	Body and shoe are prepared from one piece. Handle is separate. The beam is curved in the middle. The width of cut is about 8 inches.



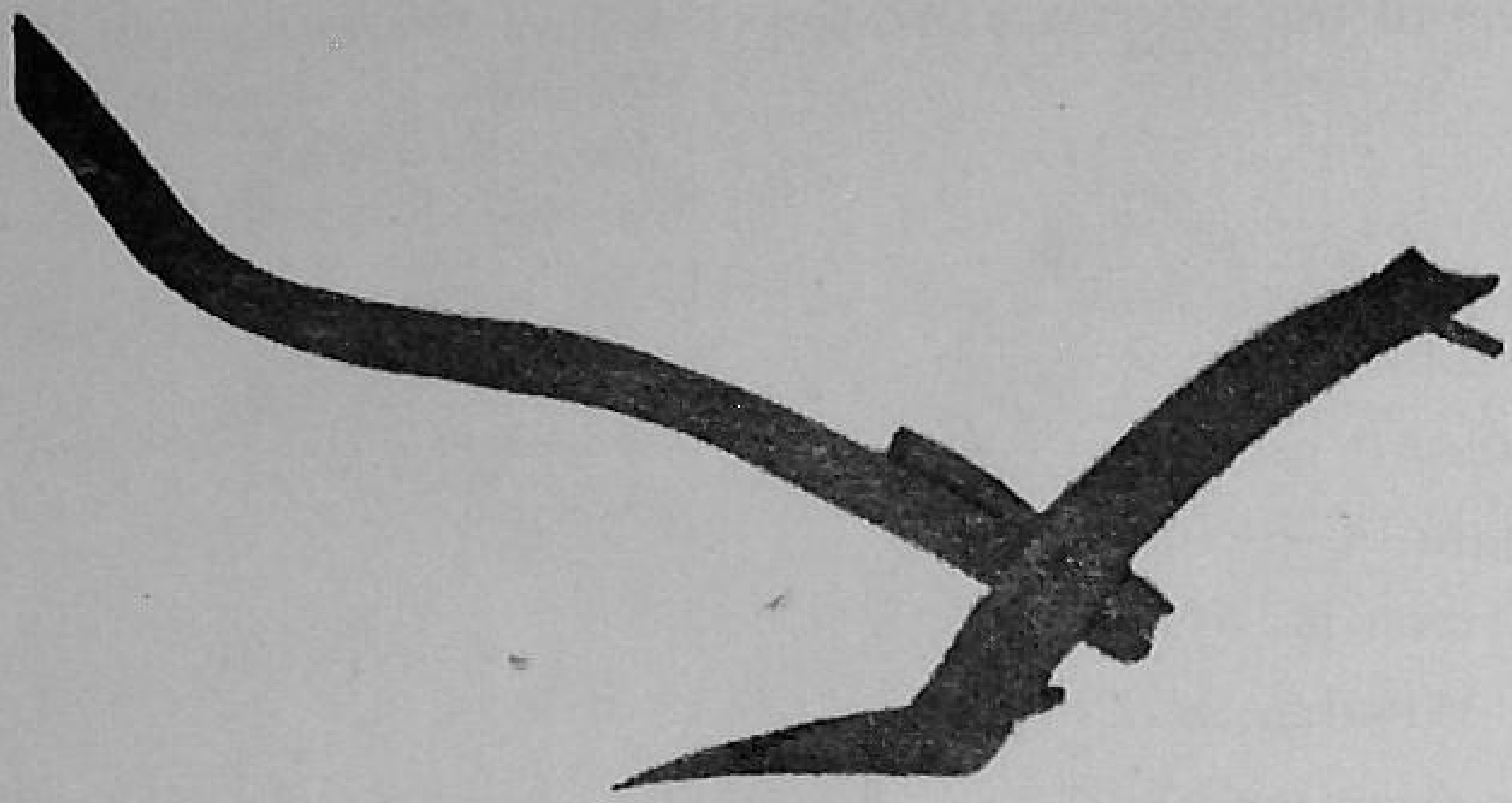
Plough (Sheopur) Madhya Bharat

PLOUGHS

Country Plough—Hal (Madhya Bharat)

1.	Classification	Land preparation implement
2.	Name (English and local)	Country plough - Hal
3.	Name of the State and District	Madhya Bharat,Sheopur, Morena, Mandasor, Jhabua, Indore, Ujjain, Ratlam, Shajapur, Rajgarh, Nimar, Dhar*
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Babul, Kher wood and mild steel
6.	Weight of the implement	45-55 lb.
	(i) Iron part	2-3 lb.
	(ii) Wooden part	43-52 lb.
7.	Operating power	One pair of bullocks and one person
8.	Cost	Rs. 10 to 25
9.	Service life	2-4 years
10.	Usage	For preparation of seed bed
11.	Method of application	Beam of the implement is attached to the yoke by means of ropes etc.
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.25 to 1.00
14.	Work rate	0.50 acre per day
15.	Cost of operation per acre	Rs. 10 to 20
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	The body and handle are made in one piece and shoe is separate. The average depth is 5-6 inches and width 8 to 9 inches in light soils. The draft varies from 125-200 lb. in light soils.

*This type is also found in use in the following places : Jabalpur, Chindwara, Balaghat of M.P; Ganganagar, Bikaner, Jodhpur, Chitorgarh, Bharatpur, Jaipur, Bundi, of Rajasthan State; Karnal, Amritsar, Gurdaspur of Punjab; West Bengal, Vindhya Pradesh and Bhopal; Kaira, Panchmahal, Sabarkantha, Mehsana, Baroda of Bombay State.



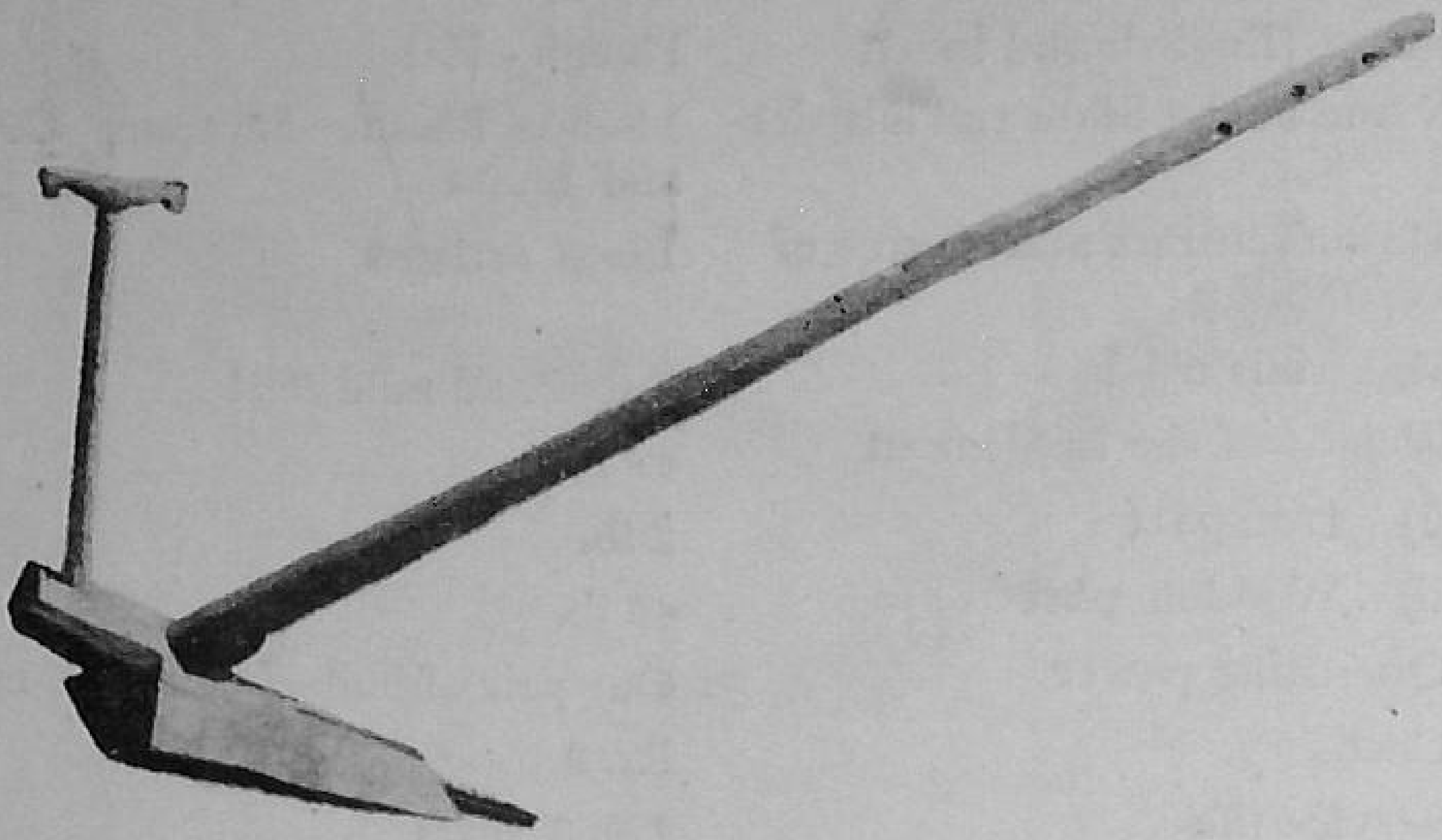
Plough (Sheopur) Madhya Bharat

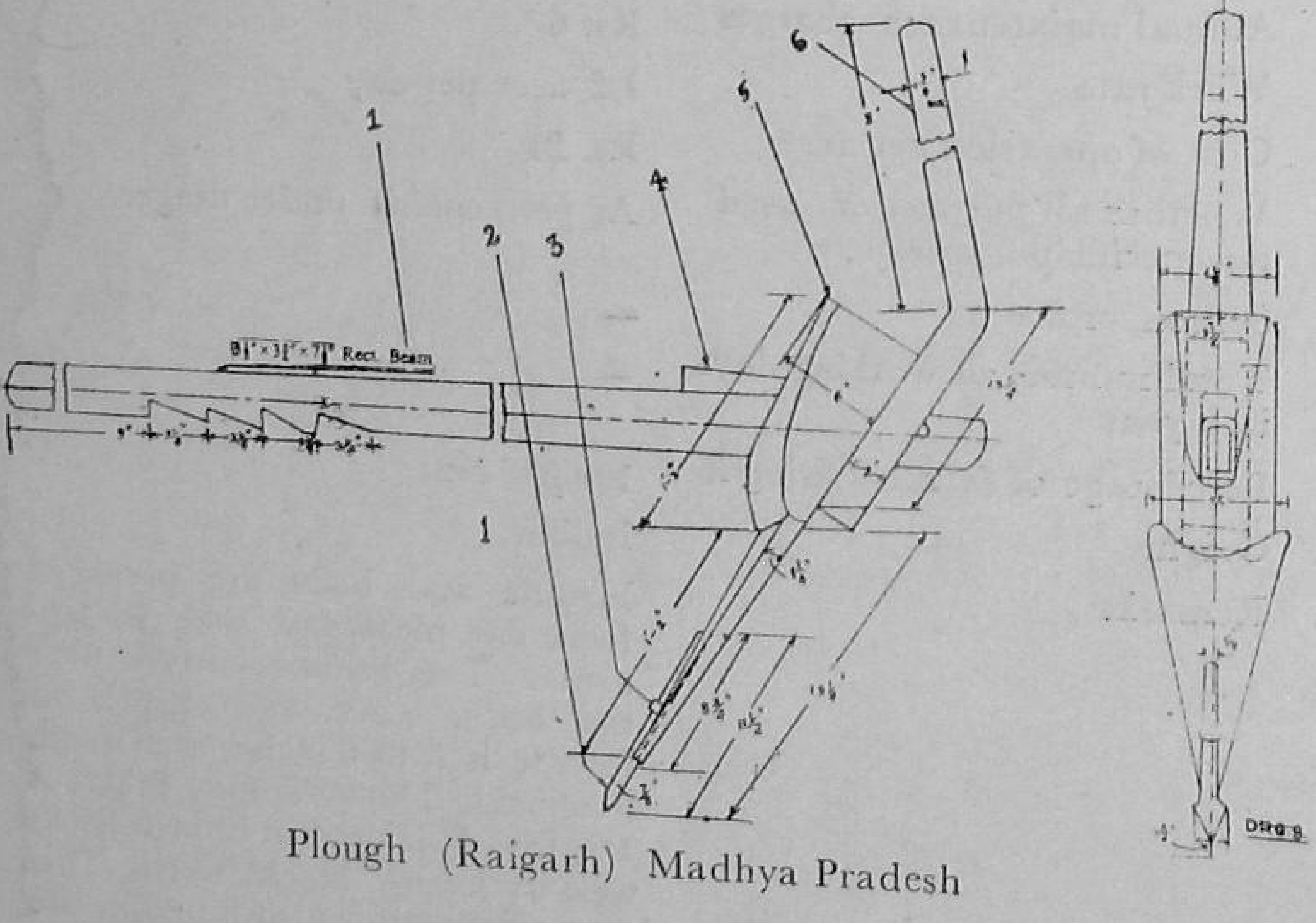
PLOUGHS

Hal (Madhya Bharat)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plough - Hal
3.	Name of the State and District	Madhya Bharat—Sheopur, Guna and Bhilsa
4.	Manufacturers and source of availability	Local artisans
5,	Materials used	Babul and mild steel
6.	Weight of the implement	48 lb.
	(i) Iron part	2 lb.
	(ii) Wooden part	46 lb.
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 9
9.	Service life	2 to 3 years
10.	Usage	For preparation of seed beds
11.	Method of application	The implement is attached to a yoke by means of ropes, etc.
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 6
14.	Work rate	1/2 acre per day
15.	Cost of operation per acre	Rs. 21
16.	Whether all purpose or used for specific purpose	As per remarks under usage.
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	Handle and body are prepared from one piece and shoe is separate. The beam is curved near the body. Average depth of furrow is 5 to 6 inches and width 9 inches. The average draft is 130 lb. It is used in light soils as well as heavy black soils. This type of plough is also found in use in Kolaba District of Bombay State.

PLATE 14



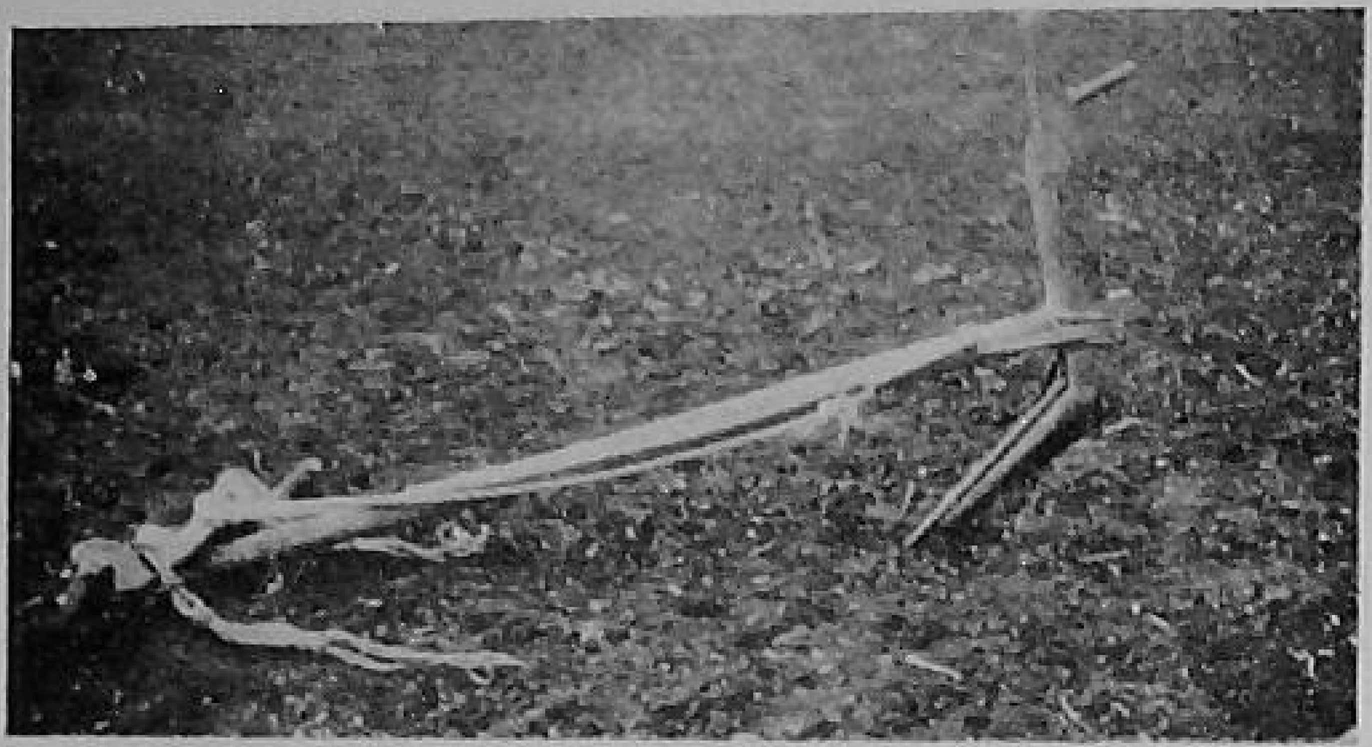


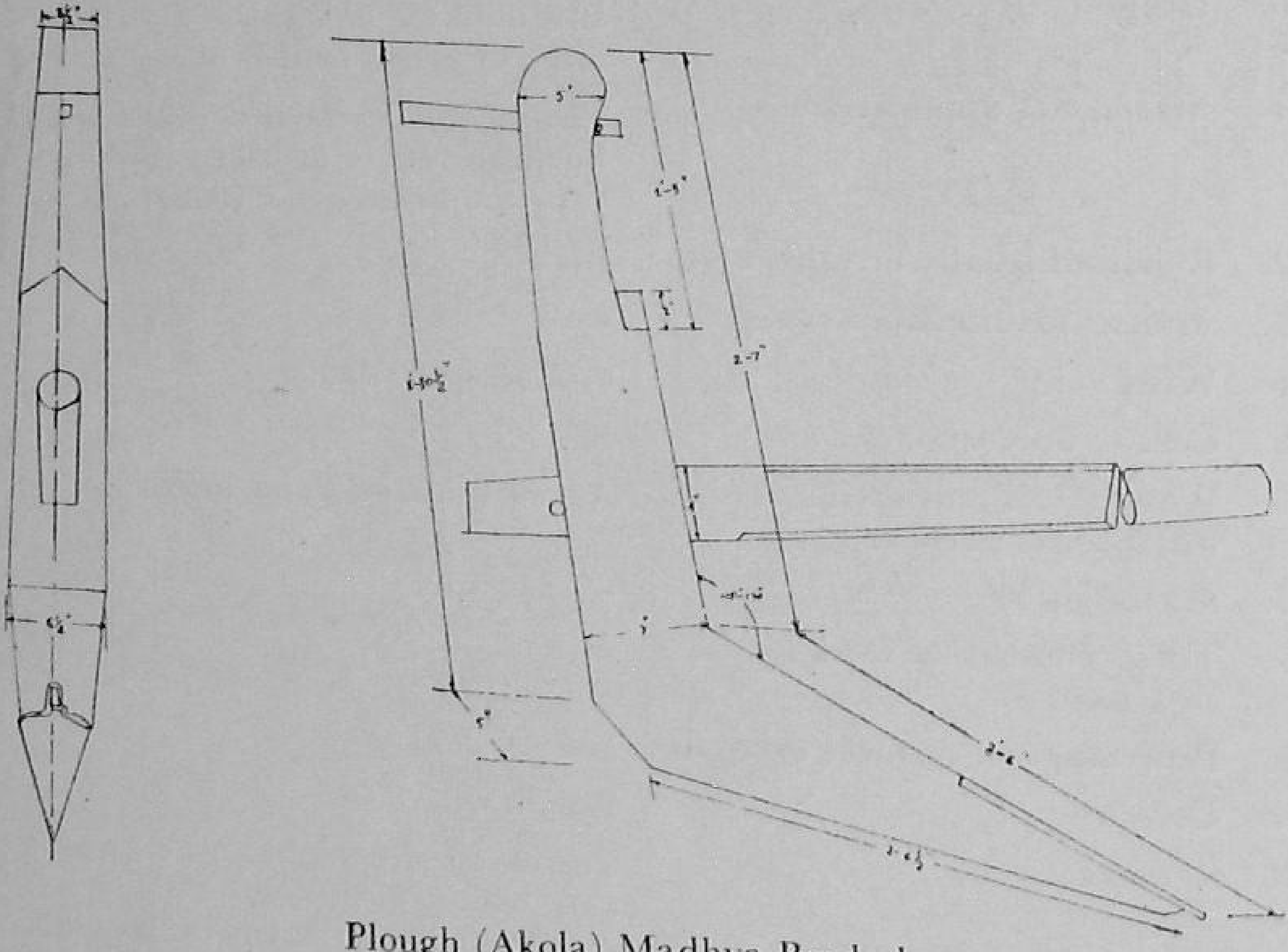
Plough (Raigarh) Madhya Pradesh

PLOUGHS

Duck Footed Plough—Hal (Madhya Pradesh)

1.	Classification	Land preparation implement
2.	Name (English and local)	Duck Footed plough– Hal
3.	Name of the State and District	Madhya Pradesh—Raigarh
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Babul, Tendu, saraj and steel
6.	Weight of implement	40 lb.
	(i) Iron part	6 lb.
	(ii) Wooden part	34 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 16
9.	Service life	5 years
10.	Usage	It is used for ploughing and puddling of paddy fields
11.	Method of application	The plough is attached to the yoke by means of tying ropes between yoke and beam of the plough
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	—
14.	Work rate	0.75 acre per day
15.	Cost of operation per acre	Rs. 7
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	The depth of ploughing is 4 inches and width 6 inches. This type of plough is also used in Ranchi and Saran Districts of Bihar State.



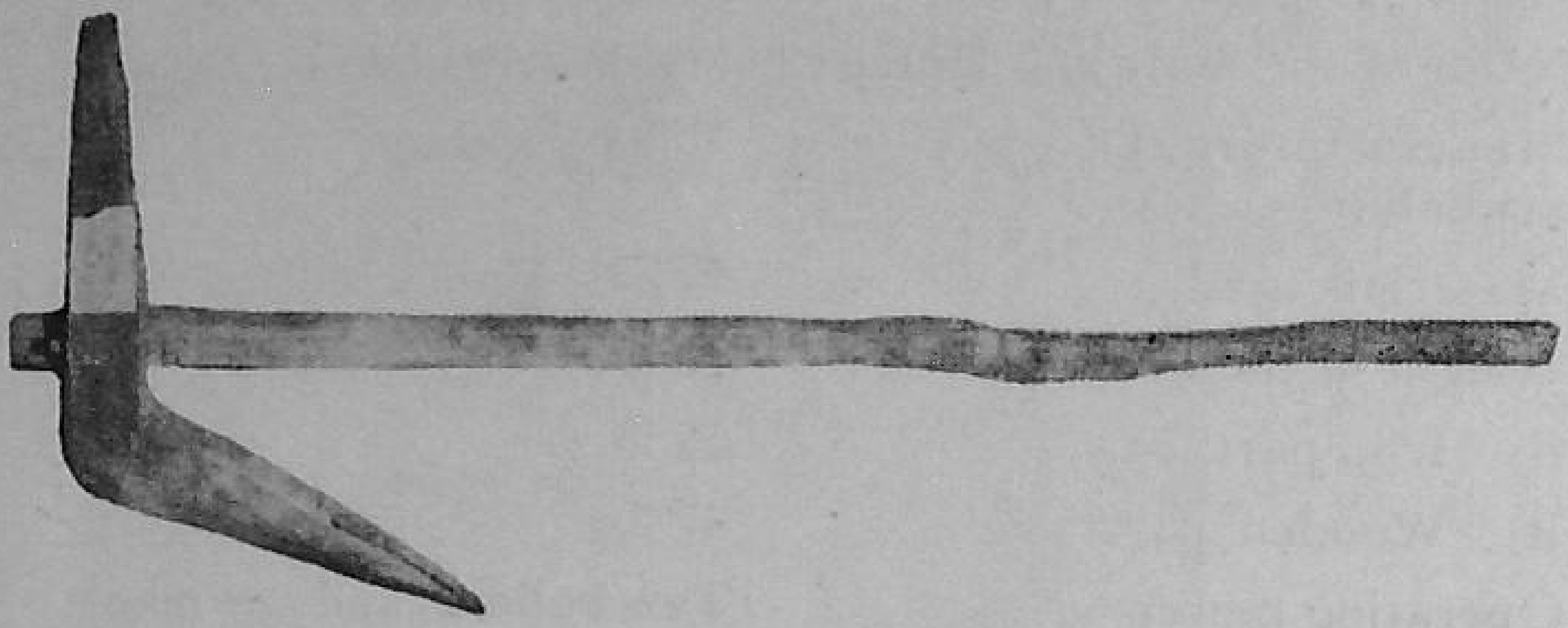


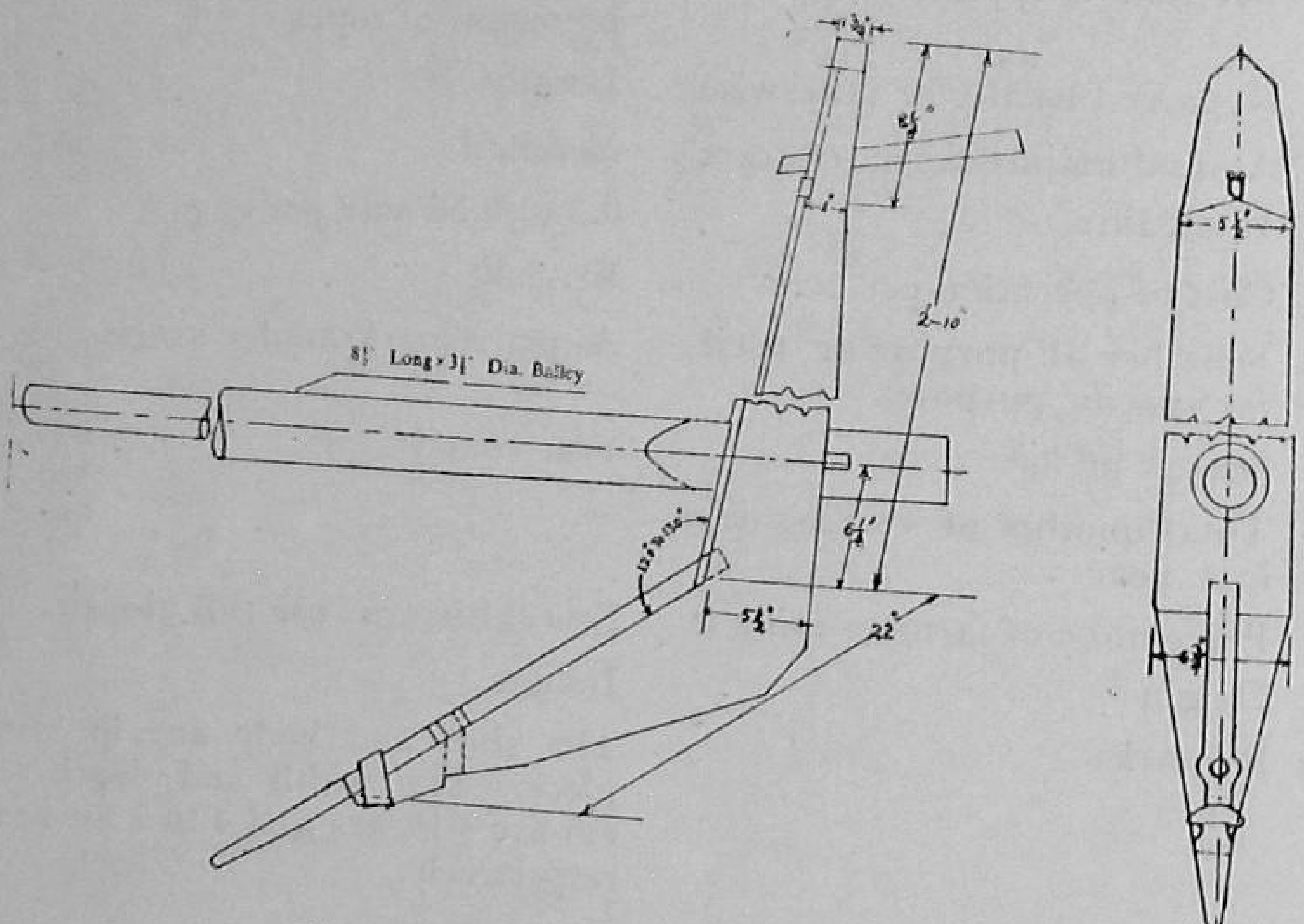
Plough (Akola) Madhya Pradesh

PLOUGHS

NANGAR—PLOUGH (MADHYA PRADESH)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plough—Nangar
3.	Name of the State and District	Madhya Pradesh—Akola
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Babul, Tinsa wood and forged iron
6.	Weight of the implement	59 lb.
	(i) Iron part	12 lb.
	(ii) Wooden part	47 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 15 to 20
9.	Service life	5 to 6 years
10.	Usage	It is used for seed bed preparation
11.	Method of application	The plough is attached to the yoke by means of ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	0.3 to 0.56 acre per day
15.	Cost of operation per acre	Rs. 3.50
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	Few cultivators use this plough
20.	Origin	Indian
21.	Remarks	The shoe and body are in one piece. The width and depth of cut are 4 inches and 4 to 7 inches respectively.



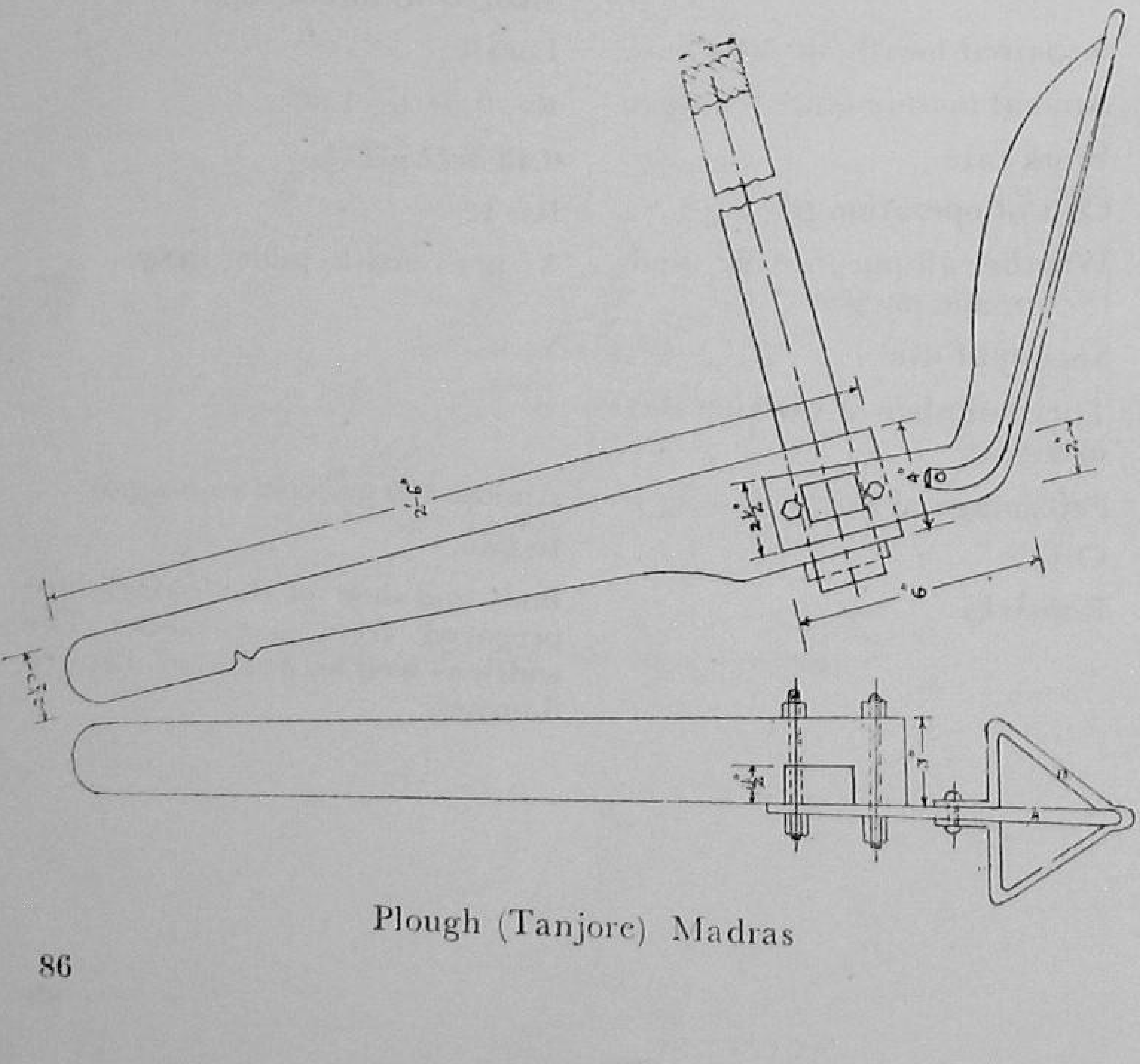


Plough (Nagpur) Madhya Pradesh

PLOUGHS

Nangar -- Plough (Madhya Pradesh)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plough - Nangar (Marathi)
3.	Name of the State and District	Madhya Pradesh—Nagpur
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Babul, sagon, tinsa wood and forged iron
6.	Weight of the implement	50 lb.
	(i) Iron Part	4 lb.
	(ii) Wooden part	46 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 20
9.	Service life	3 to 5 years
10.	Usage	Used for ploughing and preparing seed bed
11.	Method of application	The plough is attached to the yoke by means of ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.50 to 1.00
14.	Work rate	0.43 acre per day
15.	Cost of operation per acre	Rs. 12
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	Almost 100 per cent in Nagpur
20.	Origin	Indian
21.	Remarks	Body and shoe of the plough are prepared from one piece. The width as well as depth of cut are 5 inches.

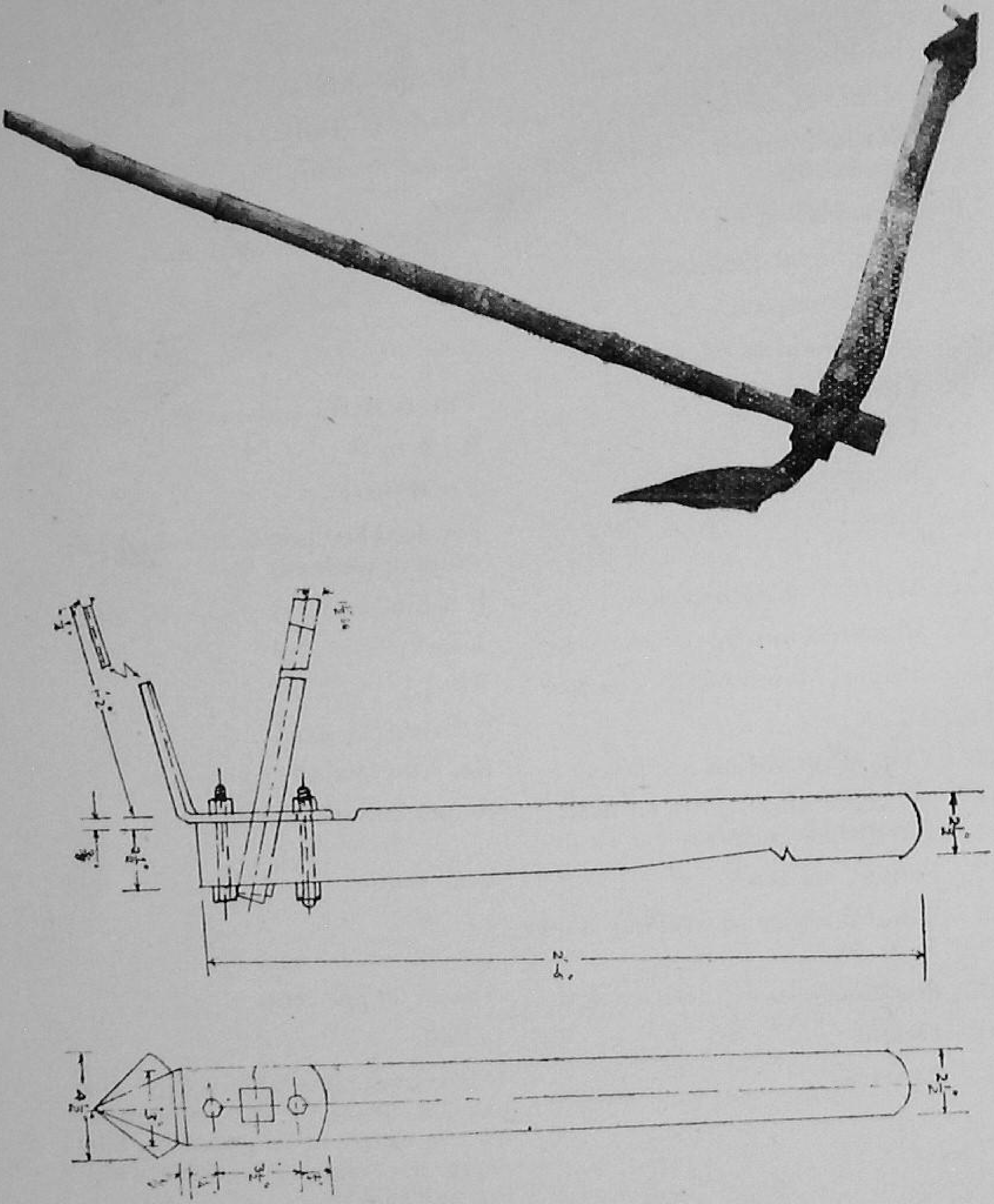


Plough (Tanjore) Madras

PLOUGHS

Mannargudi Kalappai—Plough (Madras)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plough—Mannargudi Kalappai
3.	Name of the State and District	Madras—Tanjore
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Local wood and mild steel
6.	Weight of the implement	20 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 9 to 10
9.	Service life	5 to 6 years
10.	Usage	For seed bed preparation and puddling in wetlands
11.	Method of application	It is hitched to the yoke by ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 1
14.	Work rate	0.5 acre per day
15.	Cost of operation per acre	Rs. 8 for puddling purposes
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	Almost 60 per cent
20.	Origin	Indian
21.	Remarks	It is a steel plough attached to a wooden beam. The plough is used in wetlands for puddling. The depth of ploughing in black soil is 2 to 3 inches



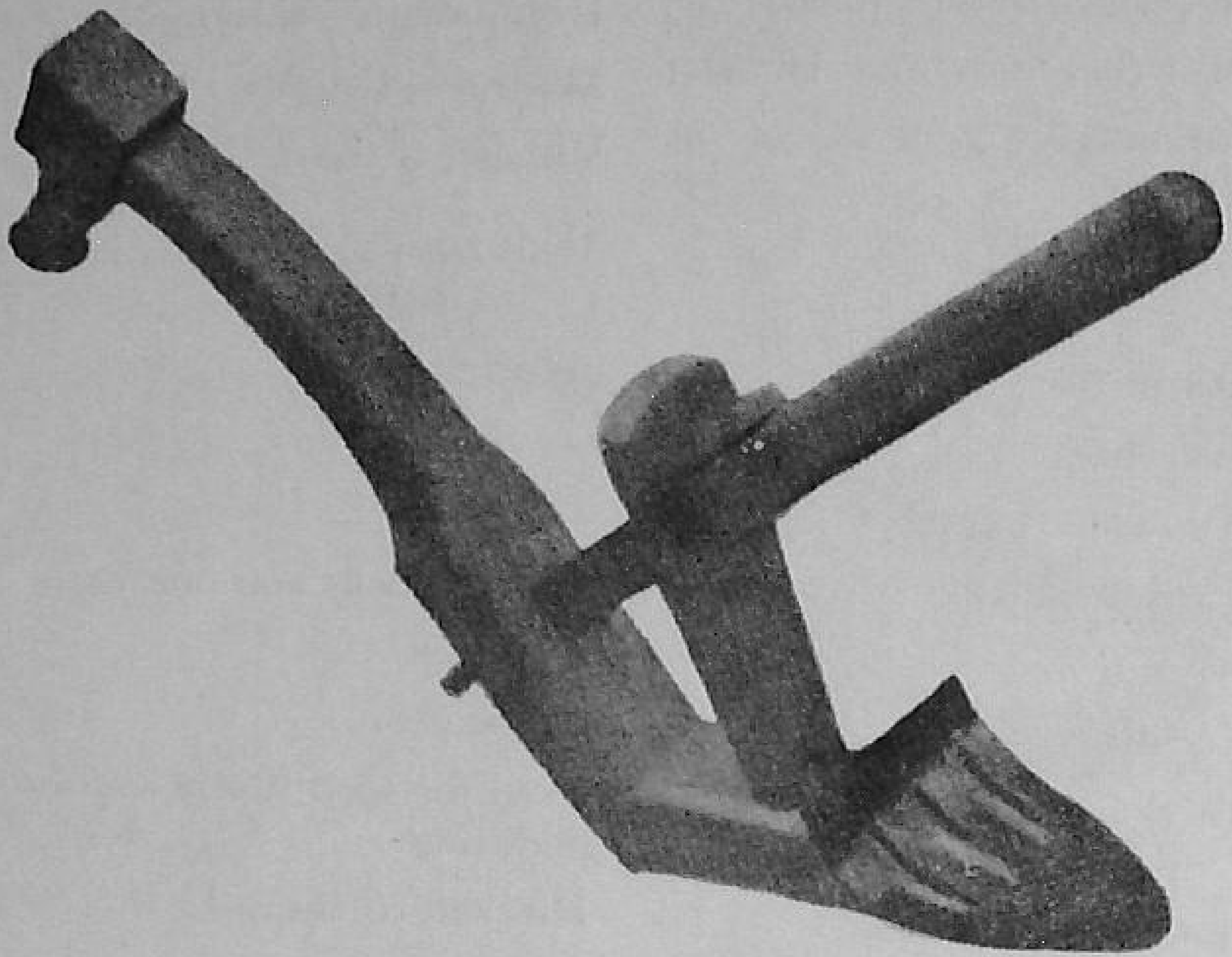
Iron Plough (Tanjore) Madras

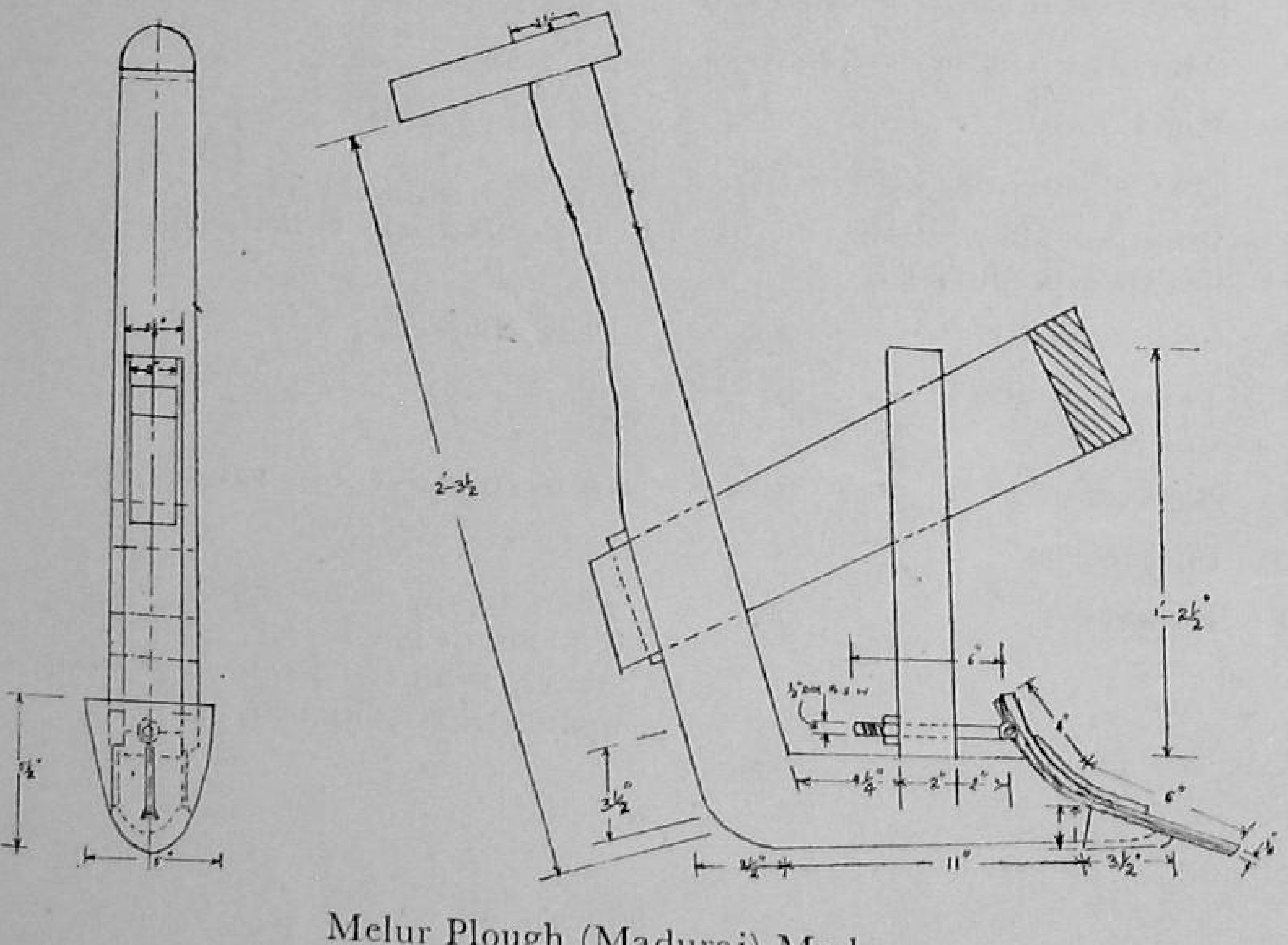
PLOUGHS

Iron Plough – Kalappai (Madras)

1.	Classification	Land preparation implement
2.	Name (English and local)	Iron plough—Kalappai
3.	Name of the State and District	Madras—Tanjore
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Mild steel and carbon steel, Karuvelam, Karumaram
6.	Weight of the implement	10 to 20 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one man
8.	Cost	Rs 7 to 8
9.	Service life	6 to 8 years
10.	Usage	Used for seed bed preparation and puddling
11.	Method of application	Hitched to the yoke by means of ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1.50
14.	Work rate	0.5 acre per day
15.	Cost of operation per acre	Rs. 9
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	10 to 15 per cent in Tanjore
20.	Origin	Indian
21.	Remarks	The depth of ploughing is 2—3 inches in black soil. The draft varies from 120-200 lb. depending upon soil conditions.

PLATE 19



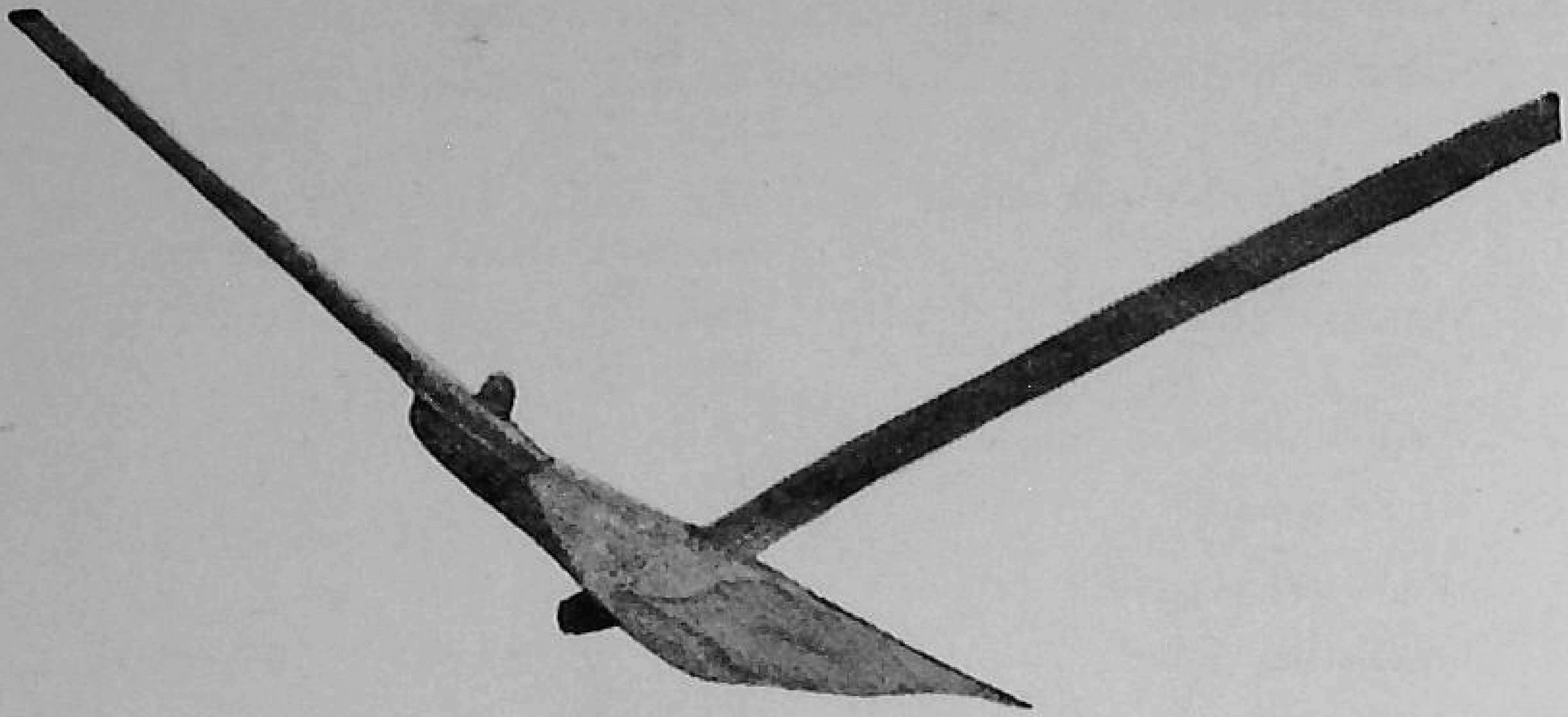


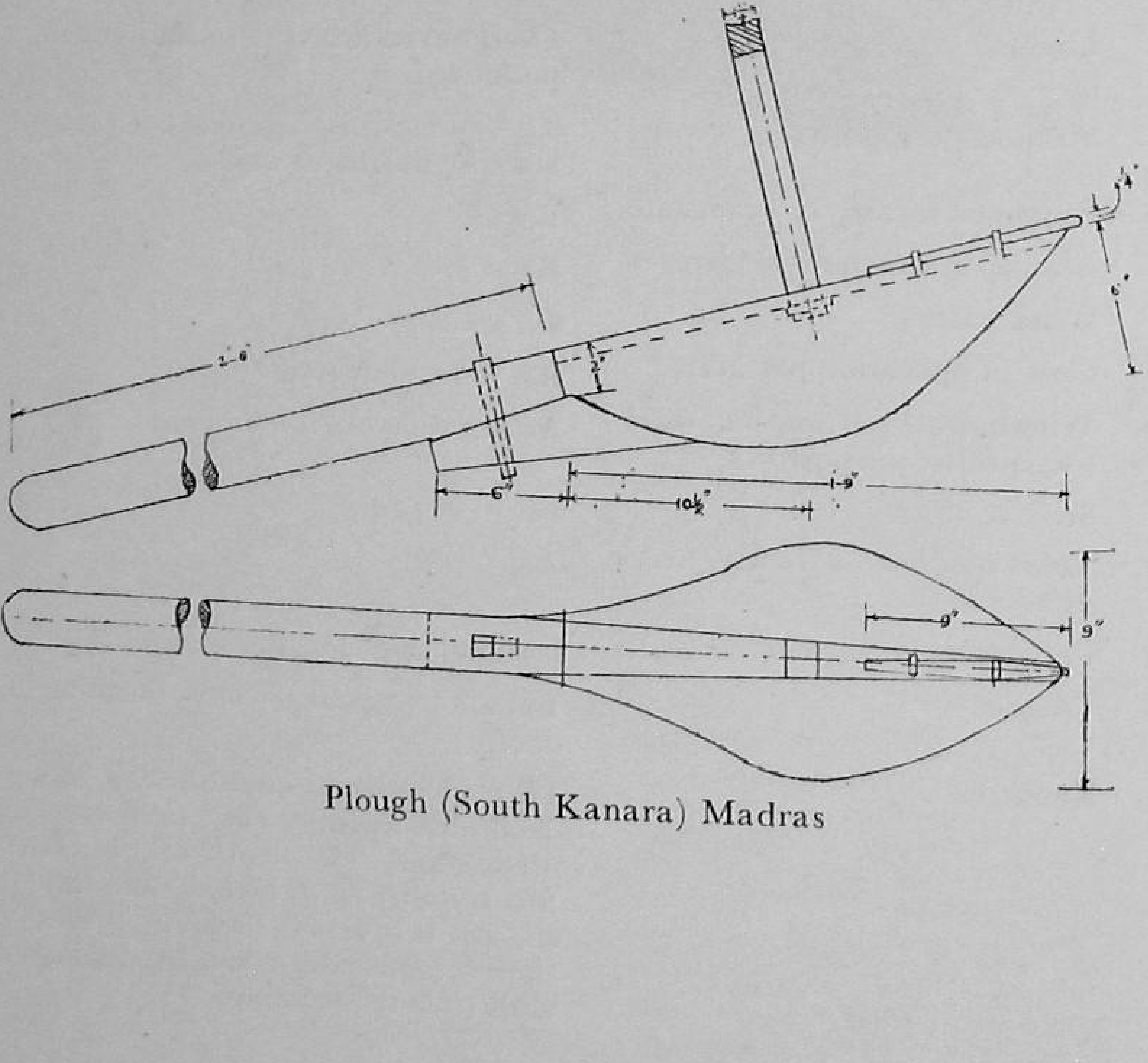
Melur Plough (Madurai) Madras

PLOUGHS

Bose or Melur Plough (Madras)

1.	Classification	Land preparation implement
2.	Name (English and local)	Bose or Melur Plough
3.	Name of the State and District	Madras—Madurai, Ramnad, Tanjore
4.	Manufacturers and source of availability	Shri V.M. Thevar at Melur in Madurai District. Local artisans
5.	Materials used	Babul or Vengai wood and C.I. or mild steel
6.	Weight of the implement	18 lb.
	(i) Iron part	3 lb.
	(ii) Wooden part	15 lb.
7.	Operating power	Two bullocks and one person
8.	Cost	Rs. 6.50
9.	Service life	4 to 5 years
10.	Usage	Used for seed bed preparation and puddling
11.	Method of application	The plough is attached to the yoke by means of ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1.5 to 2
14.	Work rate	0.5 acres per day
15.	Cost of operation per acre	Rs. 9 for puddling
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	5-10 per cent in above districts
20.	Origin	Indian (copied from Burmese design)
21.	Remarks	This plough is suitable for the Japanese method of rice land ploughing. The depth of cut in black soil is 3 inches and the width is 4—5 inches. The shoe is made of a single casting with ribbed surfacing.



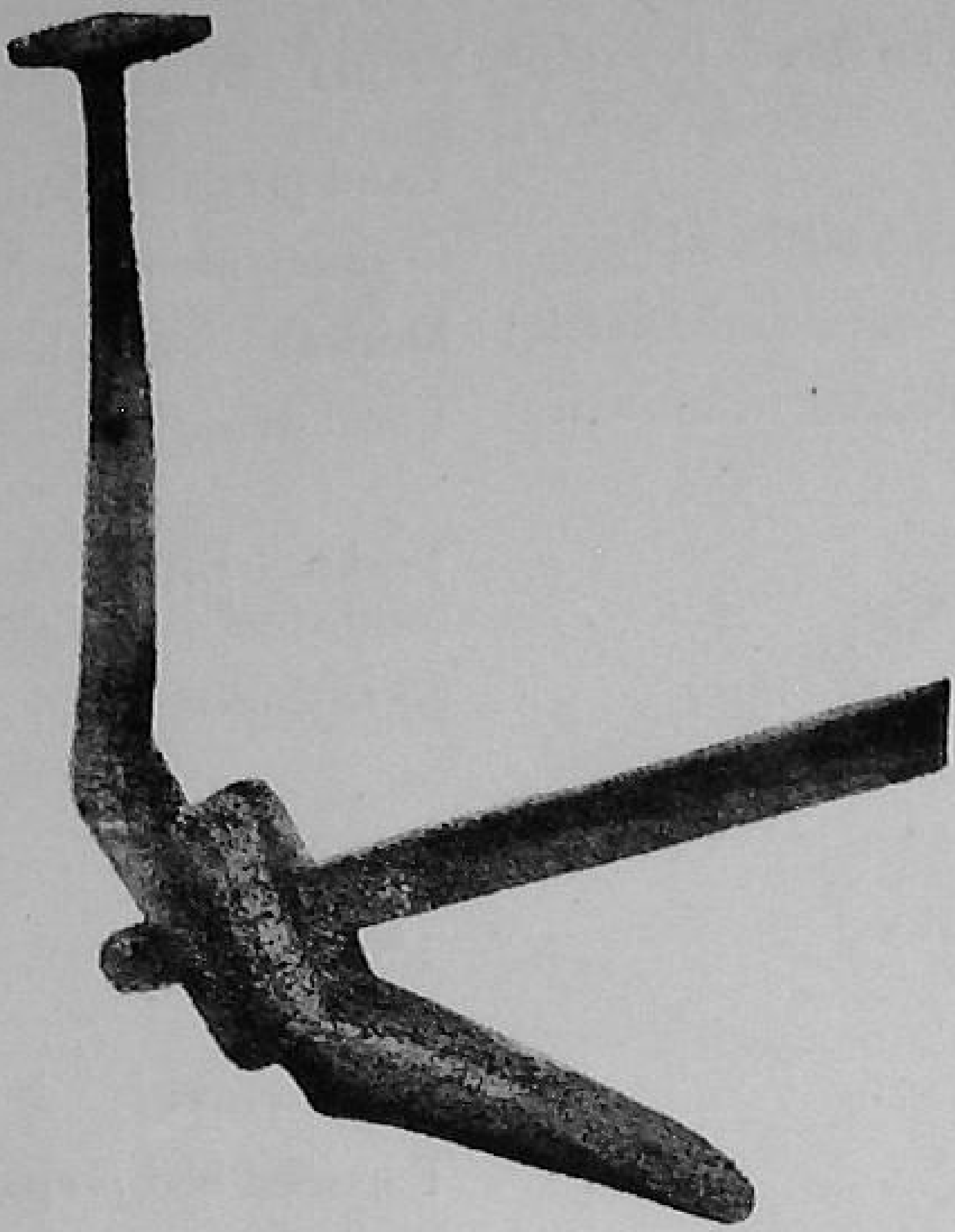


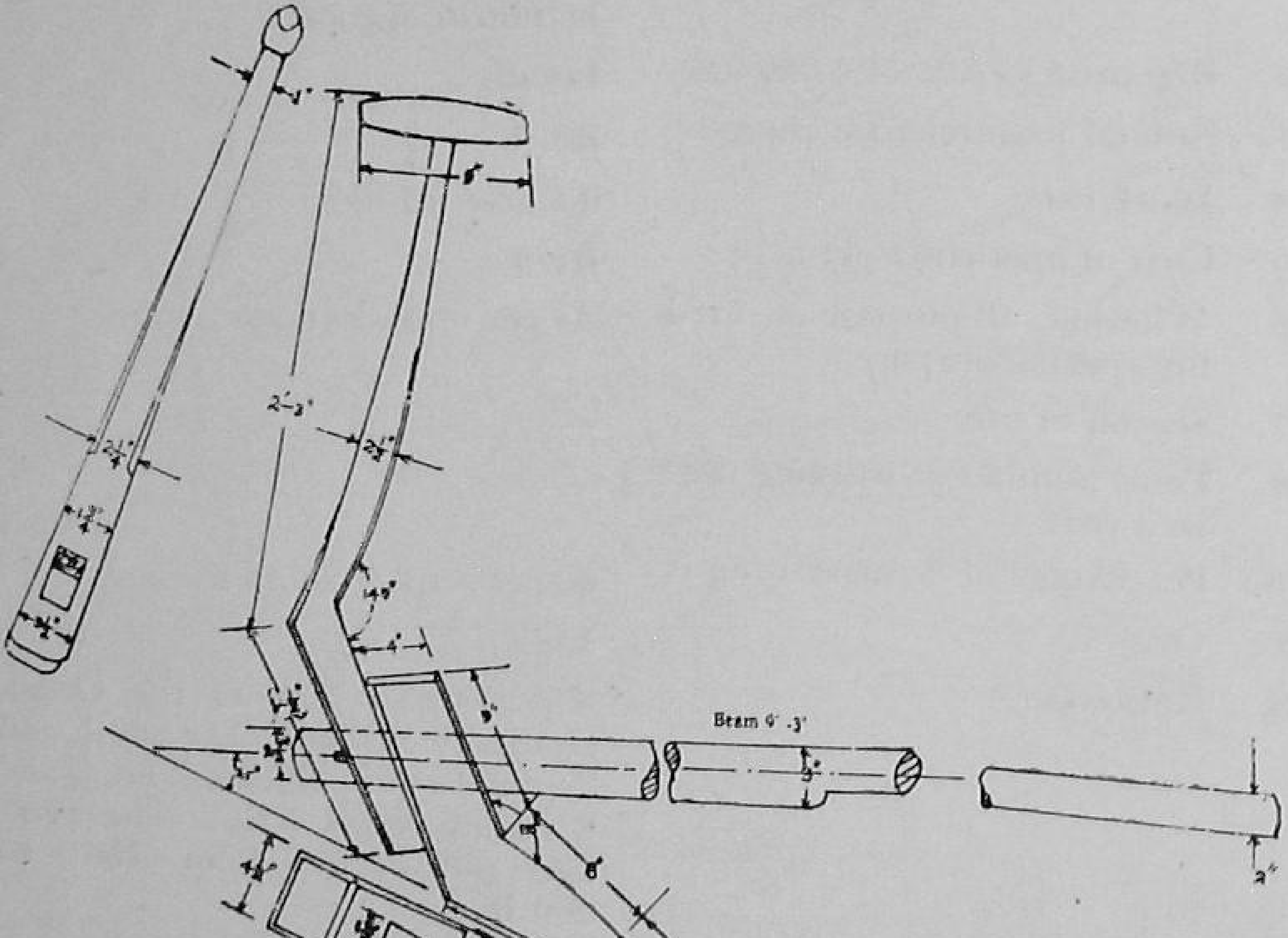
Plough (South Kanara) Madras

PLOUGHS

Country Plough—Negilu (Madras)

1.	Classification	Land preparation implement
2.	Name (English and local)	Country plough—Negilu
3.	Name of the State and District	Madras—South Kanara
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Tekku, Karuvelam wood and mild steel
6.	Weight of the implement	25 to 35 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 8
9.	Service life	3 to 4 years
10.	Usage	For seed bed preparation
11.	Method of application	The plough is hitched to the yoke by means of ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 1
14.	Work rate	0.5 acre per day
15.	Cost of operation per acre	Rs. 9
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	60 per cent in South Kanara
20.	Origin	Indian
21.	Remarks	The plough resembles the Orissa plough in outline. The width and depth of cut in black soil are 3 and 8 inches respectively. The average pull ranges from 150 to 200 lb.





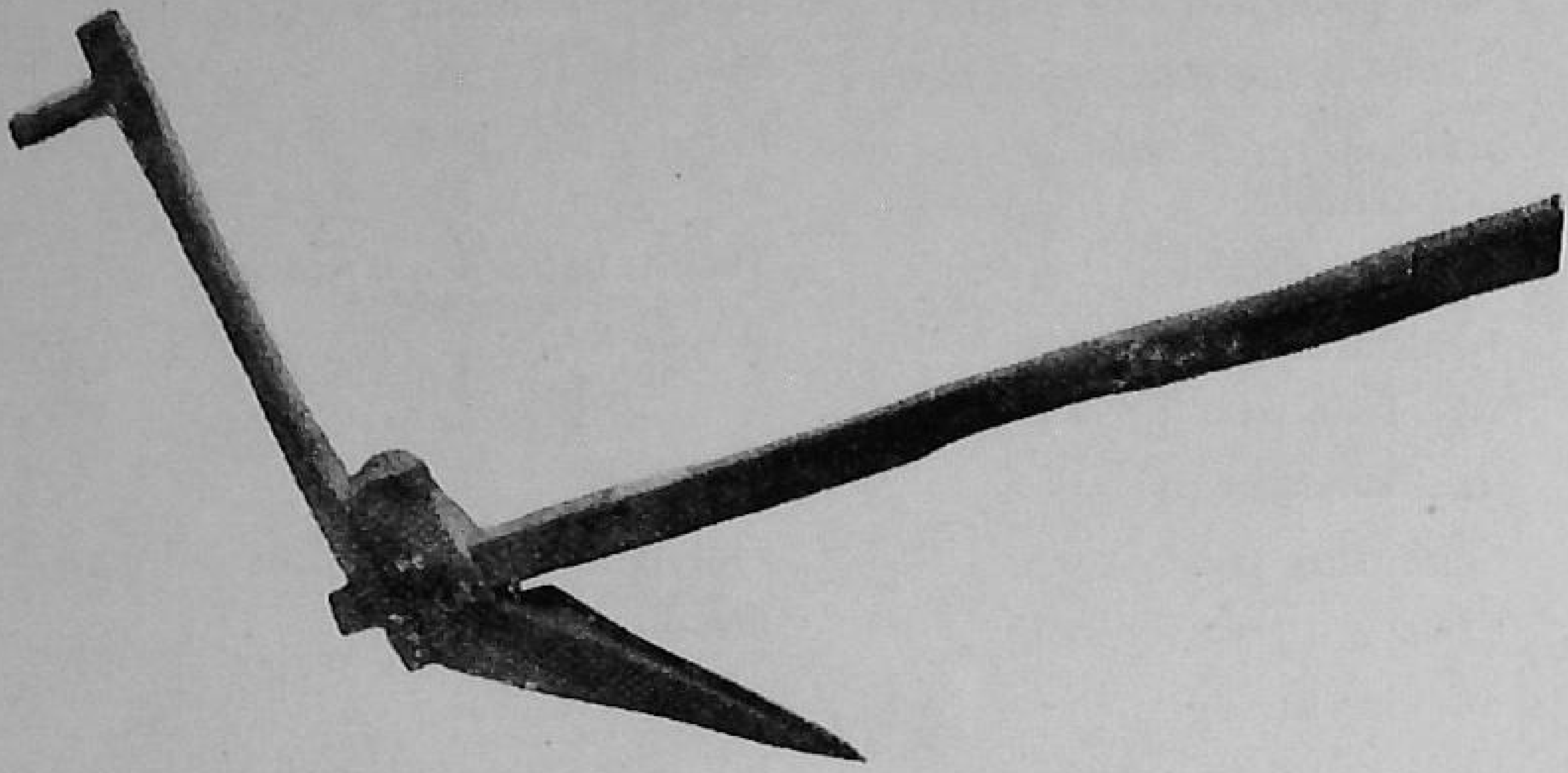
Plough (Hassan) Mysore

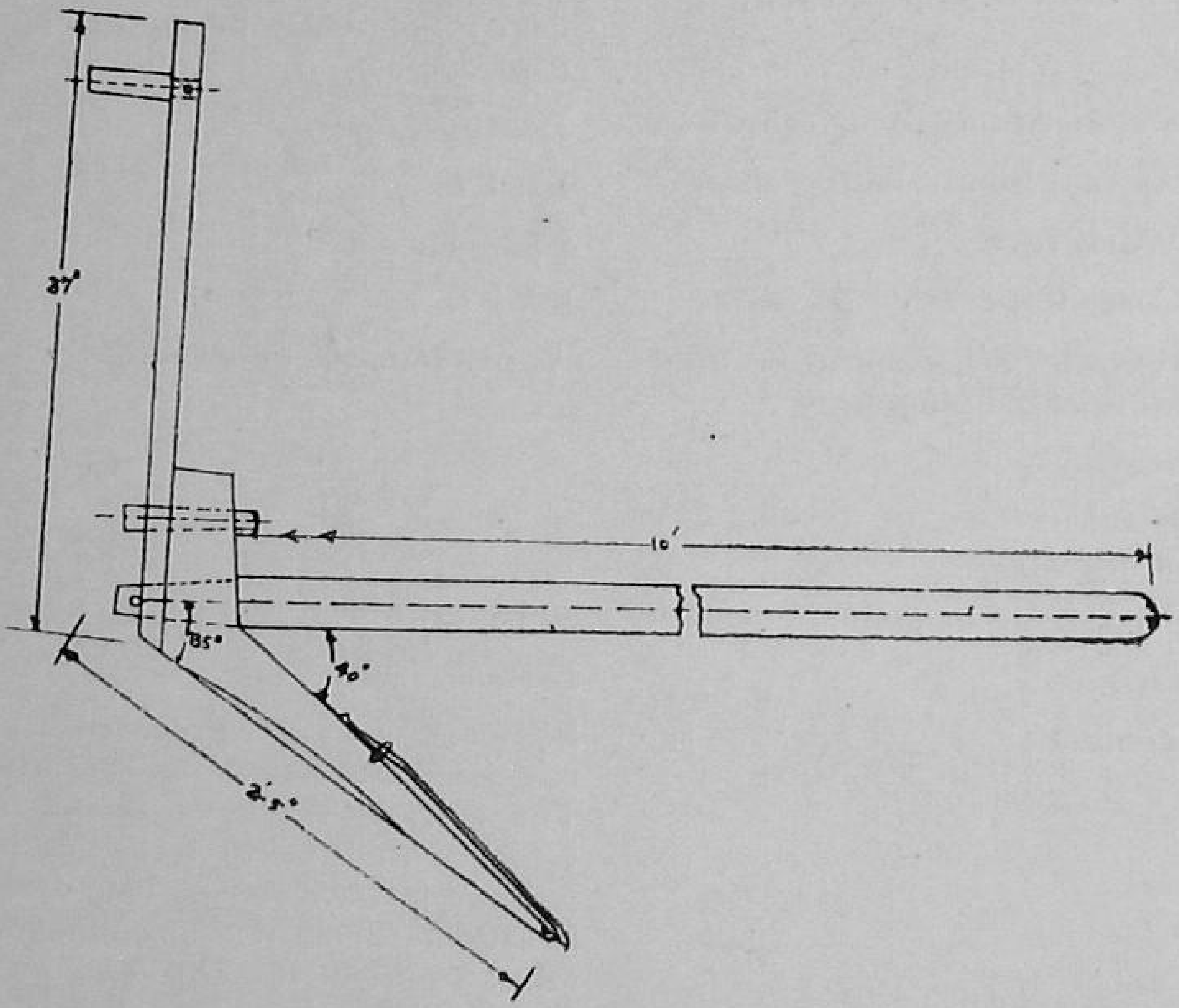
PLOUGHS

Guddala Negilu—Plough (Mysore)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plough—Guddala Negilu
3.	Name of the State and District	Mysore—Hassan
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Mathi, Babul wood and mild steel
6.	Weight of the implement	30 - 70 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 6 to 12
9.	Service life	—
10.	Usage	For preparation of seed bed
11.	Method of application	The implement is attached to the centre of yoke by means of a rope.
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1 to 3
14.	Work rate	2 acres per day
15.	Cost of operation per acre	Rs. 5 to 7
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	90 per cent
20.	Origin	Indian
21.	Remarks	Body and shoe are prepared from one piece and handle is separate. The average depth of furrow is 7 inches and width 9 inches in red and laterite soils. The draft is 140 lb. Such type of ploughs are also used in Dharwar and Kolaba Districts of Bombay State. The plough used in Dharwar District is heavier and requires two pair of bullocks.

PLATE 22





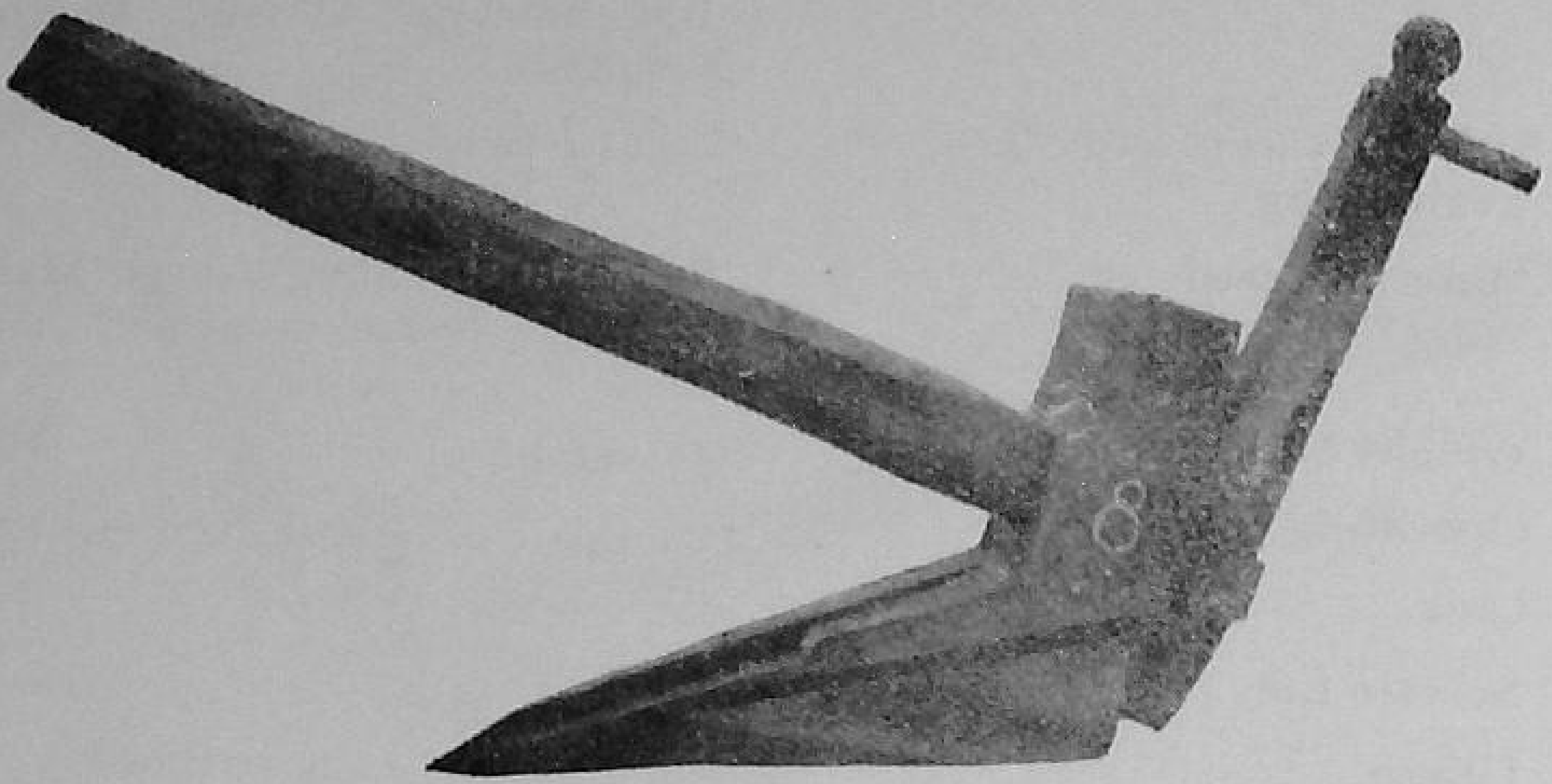
Plough (Bangalore) Mysore

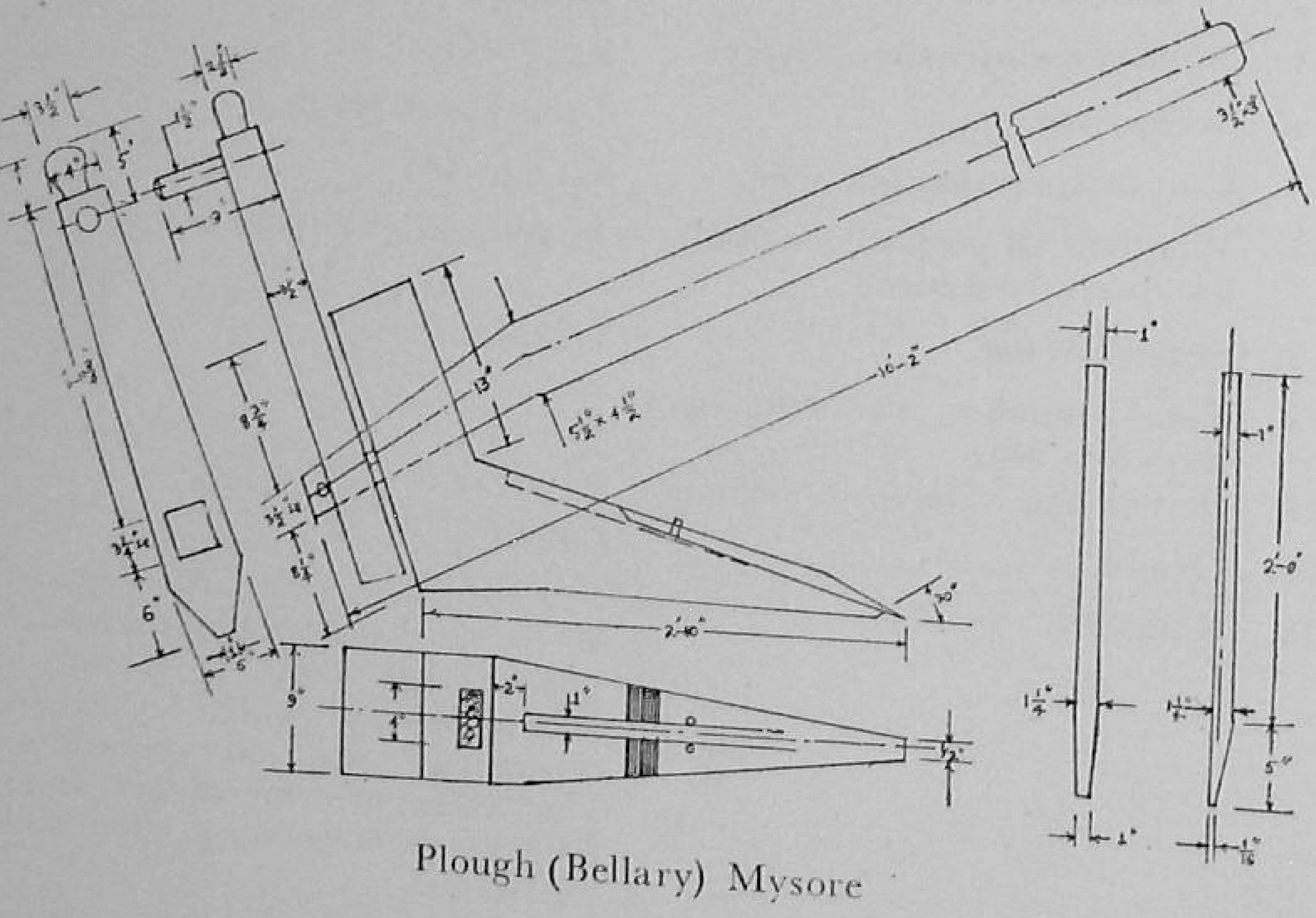
PLOUGHS

NADA, NEGILU—PLOUGH (MYSORE)

1.	Classification	Land preparation implement
2.	Name (English and local)	Country plough—Nada, Negilu
3.	Name of the State and District	Mysore—Kolar, Tumkur, Chitaldrug, Shimoga, Mandya, Mysore, Bangalore
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Pongamia, Babul, Neem, Mathi or Nandi, Honne wood and mild steel.
6.	Weight of the implement	25—60 lb.
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 4 to 10
9.	Service life	—
10.	Usage	For preparation of seed bed
11.	Method of application	The implement is tied to the yoke by means of ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 0.50 to 1.50
14.	Work rate	0 25—1 acre per day
15.	Cost of operation per acre	Rs. 6 to 12
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	90 per cent
20.	Origin	Indian
21.	Remarks	The body and shoe are prepared in one piece and handle is separate The average depth of furrow is 4—6 inches and width 5—9 inches, depending upon soil conditions. The average draft ranges from 100-260 lb. depending upon soil conditions.

Such ploughs are also found in common use in the following parts of the country. Champaran, Patna, Monghyr, Saran, Manbhum, Santhal Parganas of Bihar State; Guntur, West Godavari, Anantapur, Cuddapah, Chittoor, Srikakulam, Krishna of Andhra State; Warrangal, Medak, Bidar, Hyderabad of Hyderabad State; Carnatic and Central districts and Malabar of Madras State; Balasore, Mayurbhanj, Koraput of Orissa State; Barielly, Ballia of Uttar Pradesh; West Bengal and Coorg States.





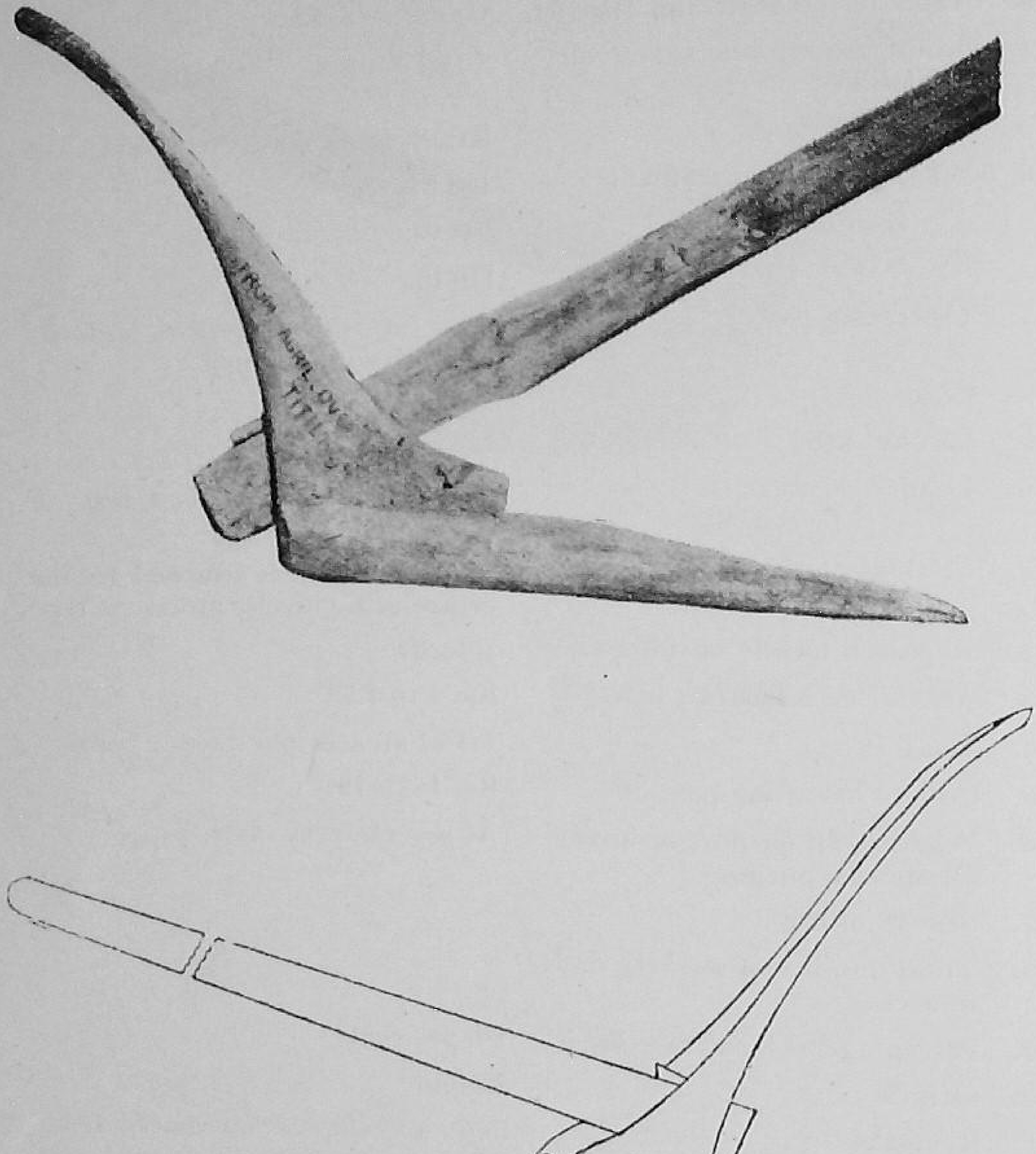
Plough (Bellary) Mysore

PLOUGHS

Nade-Negilu—Plough (Mysore)

1.	Classification	Land preparation implement
2.	Name (English and local)	Country plough - Nade-Negilu
3.	Name of the State and District	Mysore - Bellary
4	Manufacturers and source of availability	Local artisans
5.	Materials used	Babul, hard wood and mild steel
6.	Weight of the implement	120 lb.
	(i) Iron part	10 lb.
	(ii) Wooden part	110 lb.
7.	Operating power	Two or three pairs of bullocks and two to three men
8.	Cost	Rs. 30
9.	Service life	—
10.	Usage	For preparation of seed bed of crops like cotton
11.	Method of application	The implement is attached to the centre of a yoke by means of ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1 to 1.75
14.	Work rate	1/4 of an acre per day
15.	Cost of operation per acre	Rs. 18 to 19
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	80 per cent
20.	Origin	Indian
11.	Remarks	Body and shoe are prepared from one piece and handle is separate. Average depth of furrow is 6 inches and width 6 inches in black soil. The draft is 290 lb.

PLATE 24



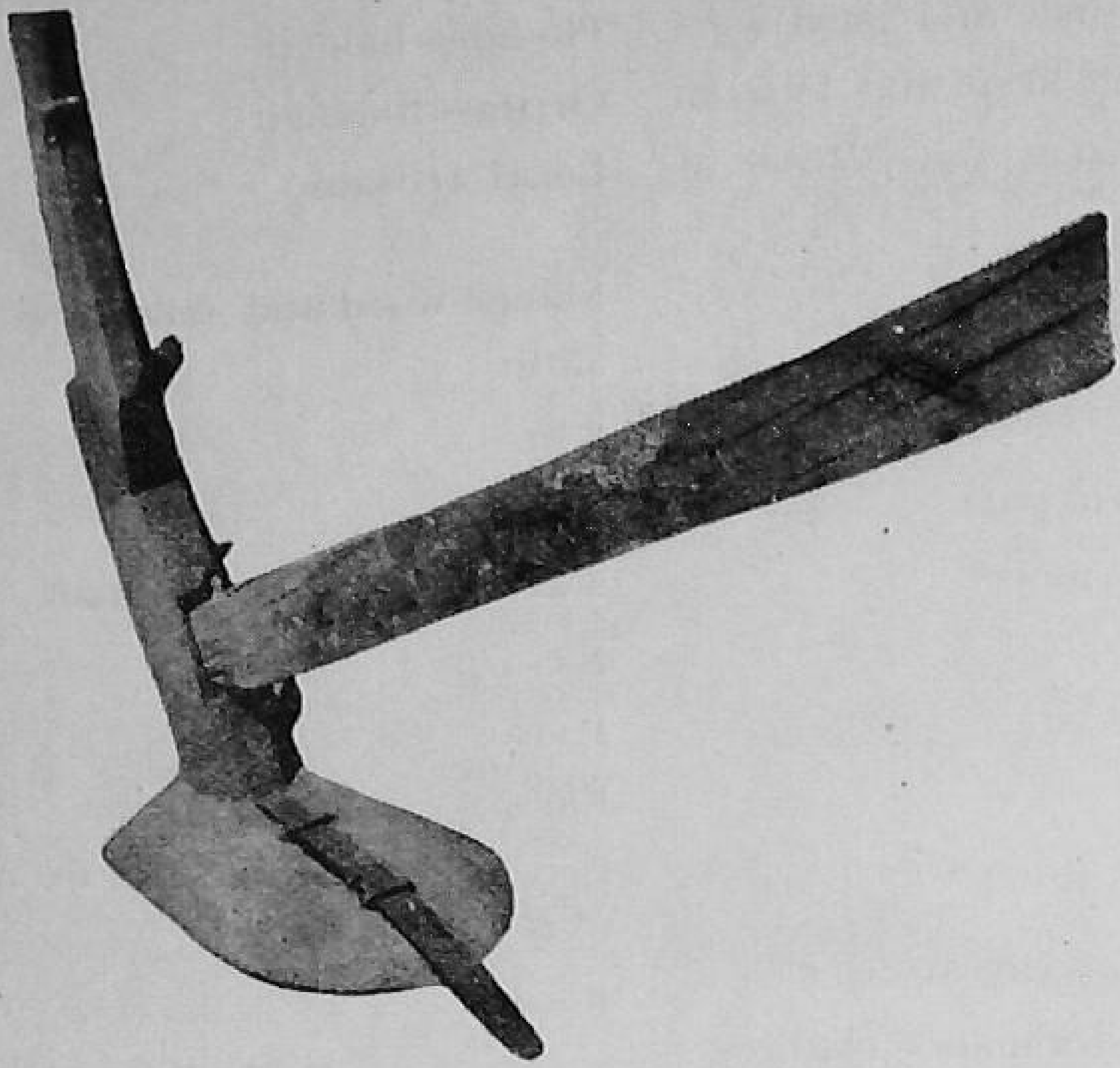
Plough (Bolangir) Orissa

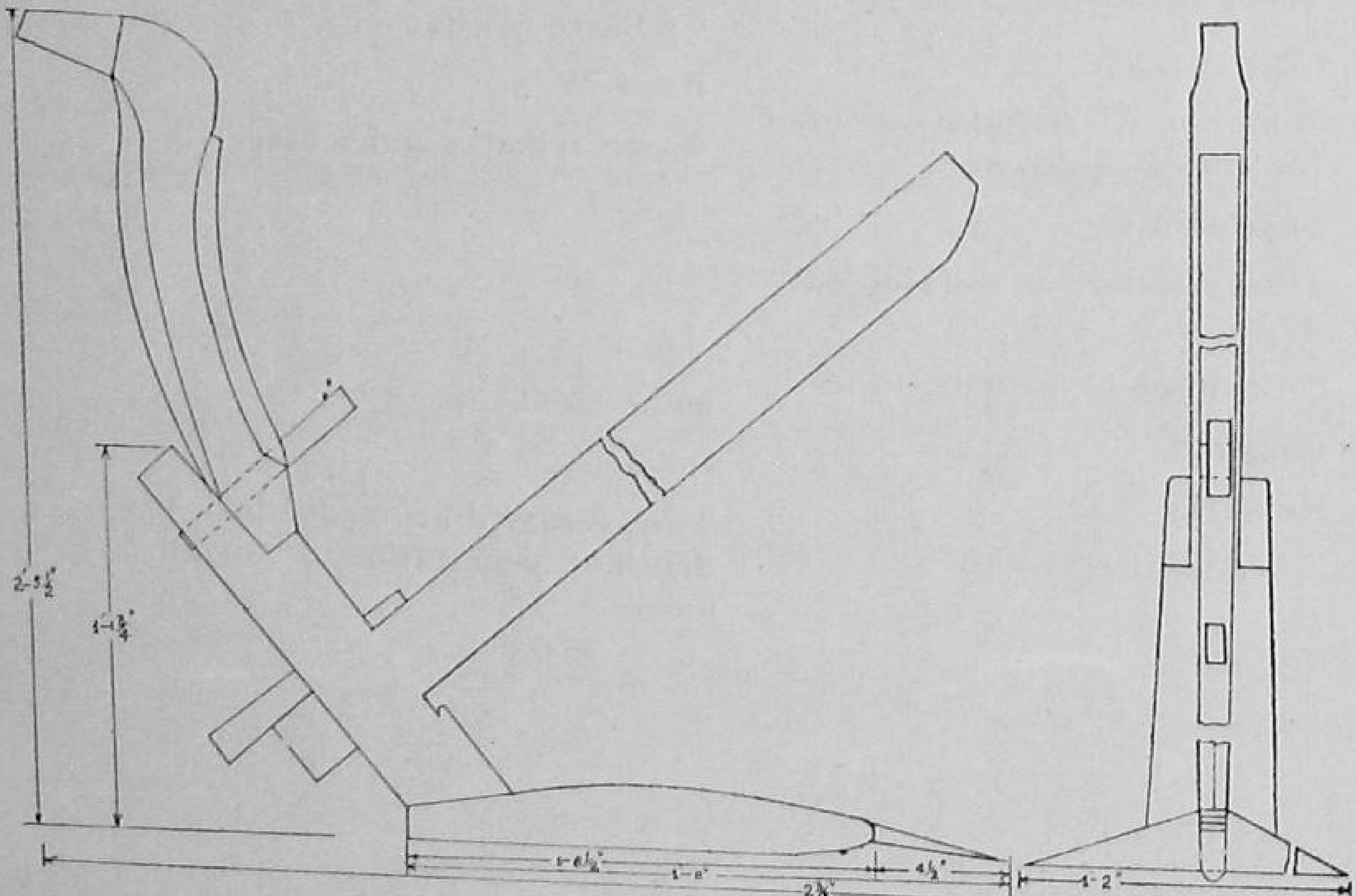
PLOUGHS

Langal—Plough (Orissa)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plough—Langal
3.	Name of the State and District	Orissa—Bolangir
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Mango wood and mild steel
6.	Weight of the implement	33 lb.
	(i) Iron part	2 lb.
	(ii) Wooden part	31 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 5
9.	Service life	1 year
10.	Usage	For seed bed preparation
11.	Method of application	It is hitched to the yoke by means of a rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	—
14.	Work rate	0.32 acre per day
15.	Cost of operation per acre	Rs. 4.75
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	99 per cent
20.	Origin	Indian
21.	Remarks	The average draft is 208 lb. The depth of penetration is about 5 inches.

PLATE 25





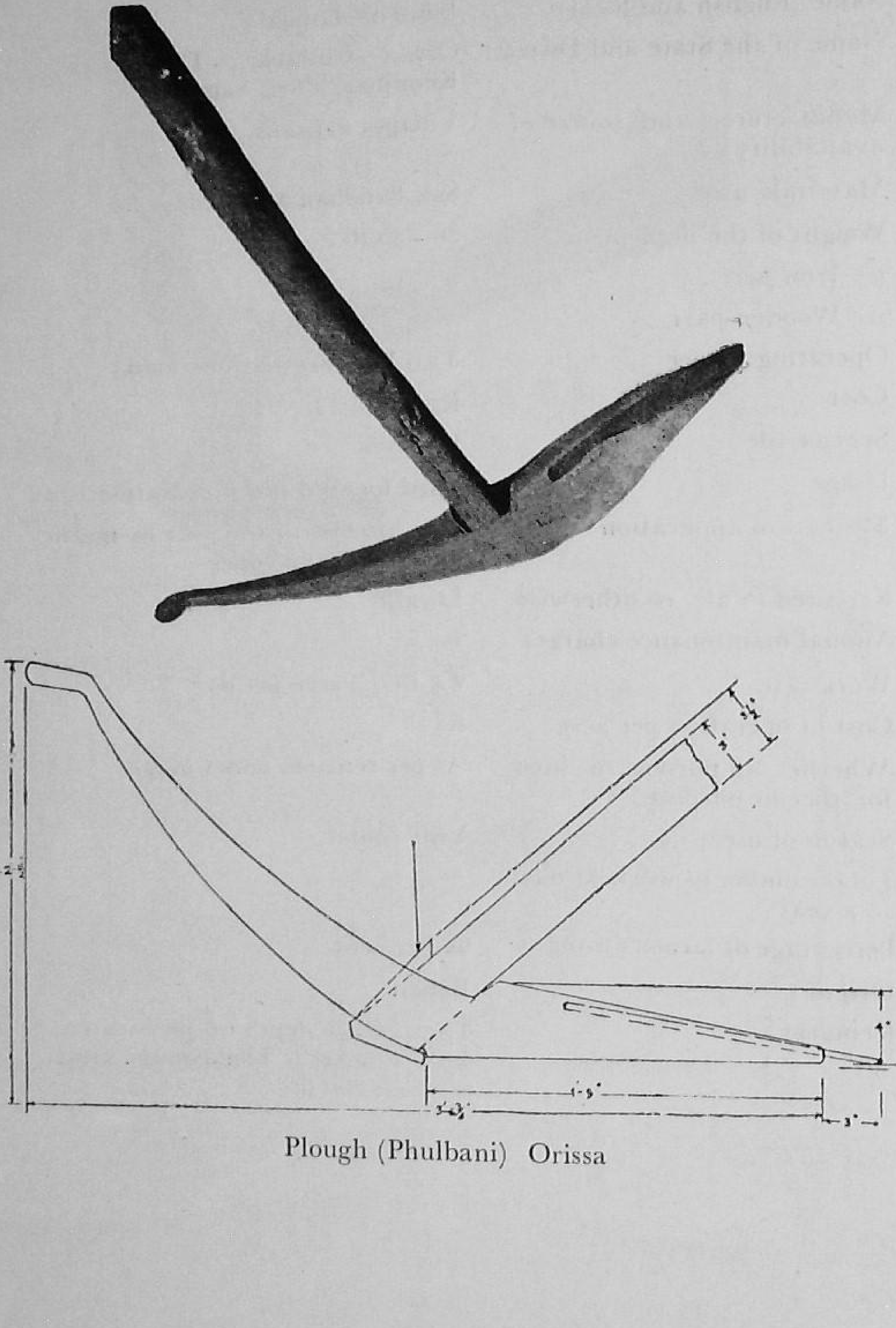
Plough (Cuttack) Orissa

PLOUGHS

Langal—Plough (Orissa)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plough—Langal
3.	Name of the State and District	Orissa—Cuttack, Dhenkanal, Keonjhar, Puri, Sambalpur
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Sal, Bandhan and mild steel
6.	Weight of the implement	26—35 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 10 to 13
9.	Service life	1—2 year
10.	Usage	Used for seed bed preparation
11.	Method of application	It is hitched to the yoke by means of a beam and ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	—
14.	Work rate	0.4 to 0.5 acre per day
15.	Cost of operation per acre	Rs. 5
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	99 per cent
20.	Origin	Indian
21.	Remarks	The average depth of penetration is 3—4 inches. The average draft is about 200 lb.

PLATE 26

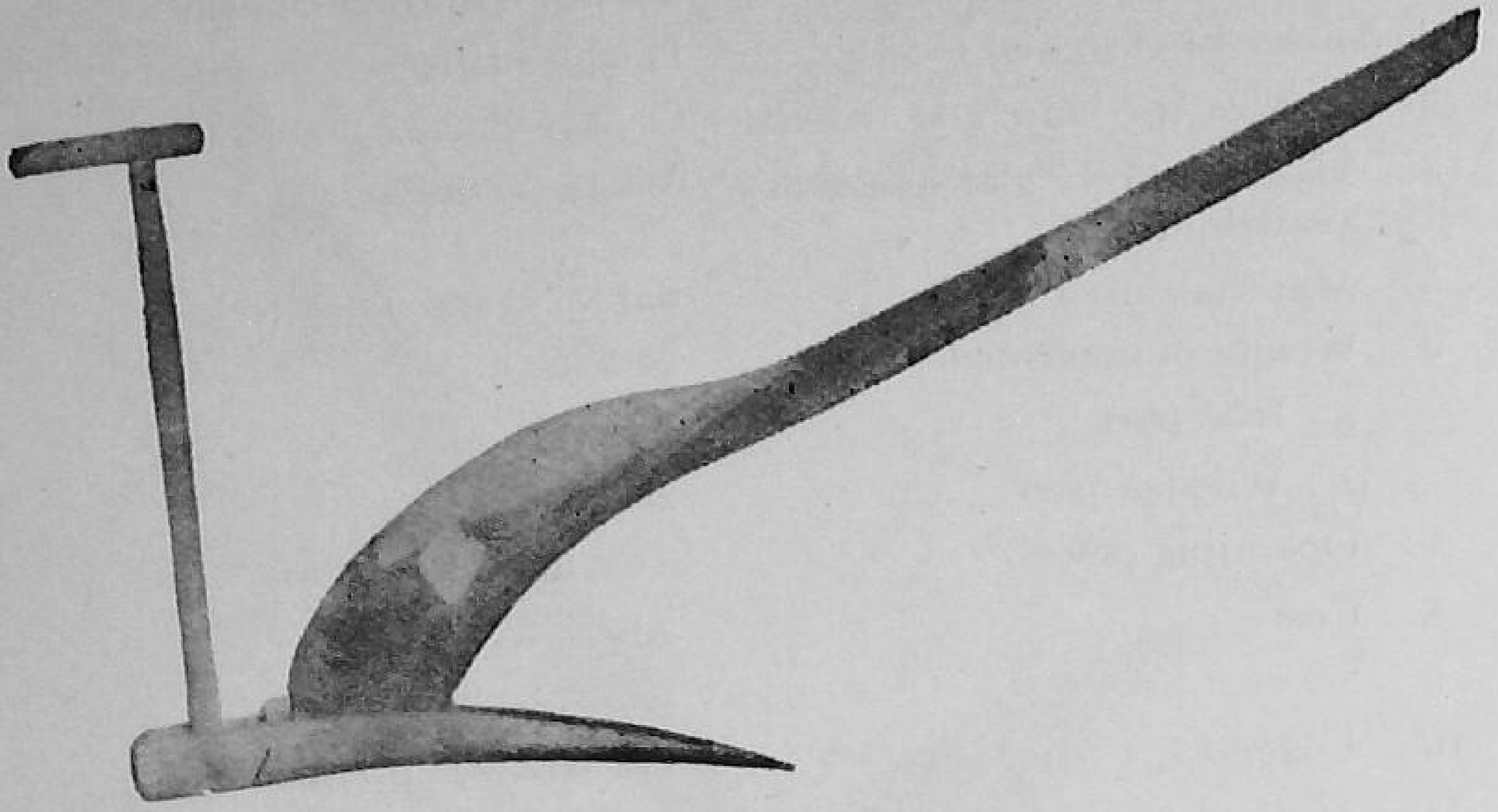


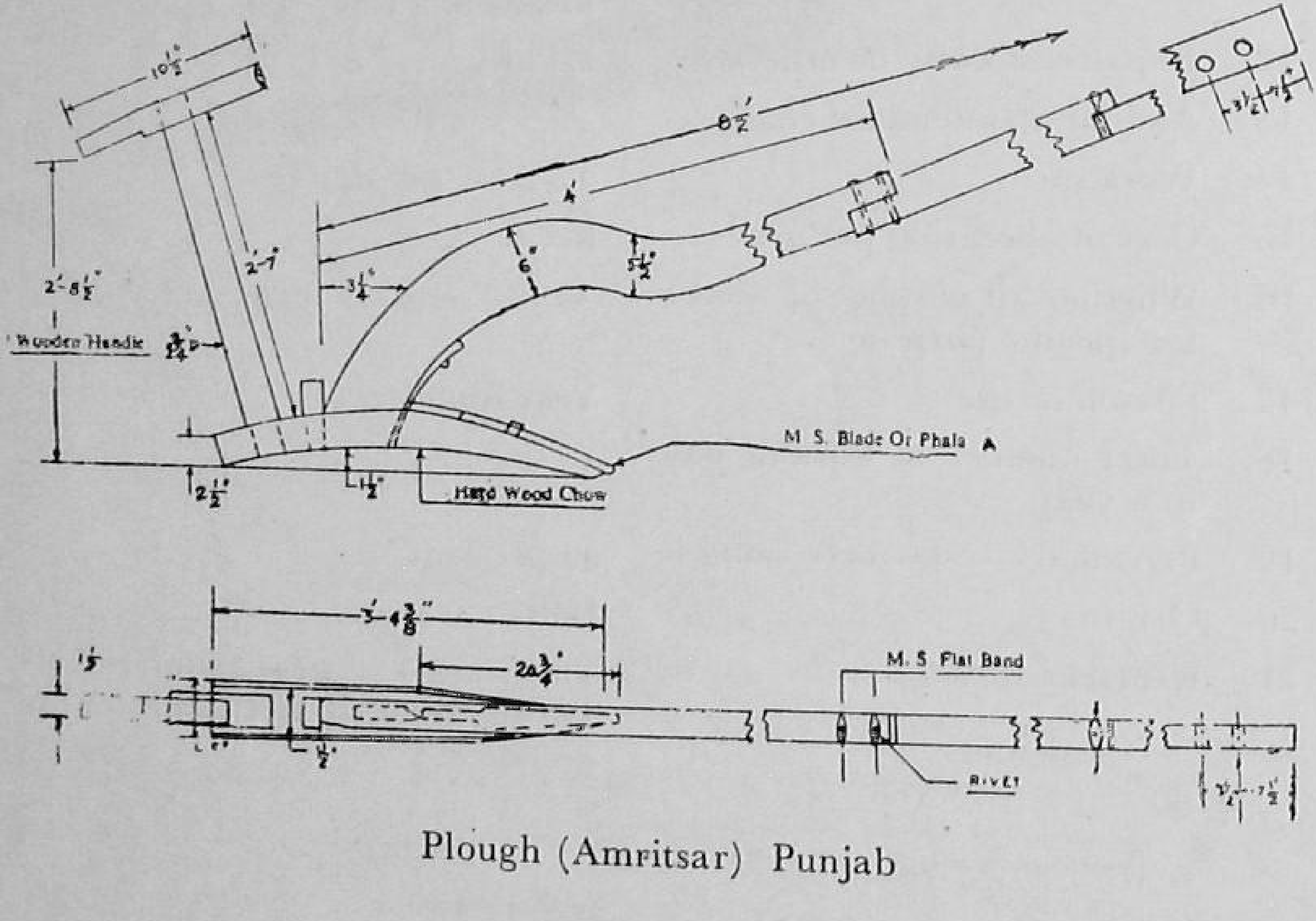
Plough (Phulbani) Orissa

PLOUGHS

Langal—Plough (Orissa)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plough—Langal
3.	Name of the State and District	Orissa—Boudh, Phulbani
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Sal wood and mild steel
6.	Weight of implement	24.5 lb.
	(i) Iron part	1.25 lb.
	(ii) Wooden part	23.25 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	About Rs. 4
9.	Service life	One year
10.	Usage	For seed bed preparation
11.	Method of application	It is attached to the yoke by means of a rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	—
14.	Work rate	0.3 acre per day
15.	Cost of operation per acre	Rs. 5
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	99 per cent
20.	Origin	Indian
21.	Remarks	The average draft is about 180 lb. The depth of cut is 4 inches on an average



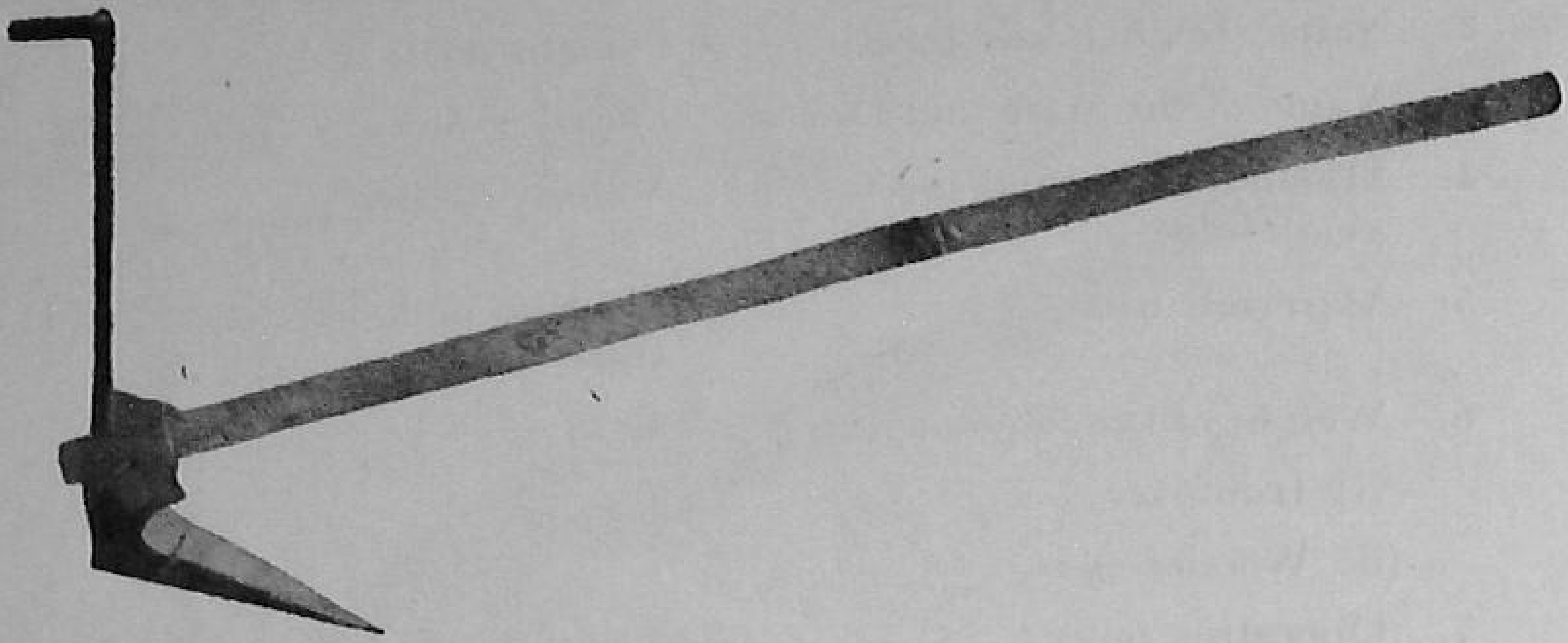


Plough (Amritsar) Punjab

PLOUGHS

Desi Hal (Punjab)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plough—Desi Hal
3.	Name of the State and District	Punjab—Amritsar and Gurdaspur
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Shisham or Kikar wood and H.C. steel
6.	Weight of the implement	49 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 14 to 15
9.	Service life	5 years
10.	Usage	For ploughing and seed bed preparation
11.	Method of application	The plough is hitched to the yoke by ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 5
14.	Work rate	One acre per day
15.	Cost of operation per acre	Rs. 6
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	The average draft is 140 lb. The depth of cut in alluvial (sandy loam) soil is 5 inches and is width 8 inches.

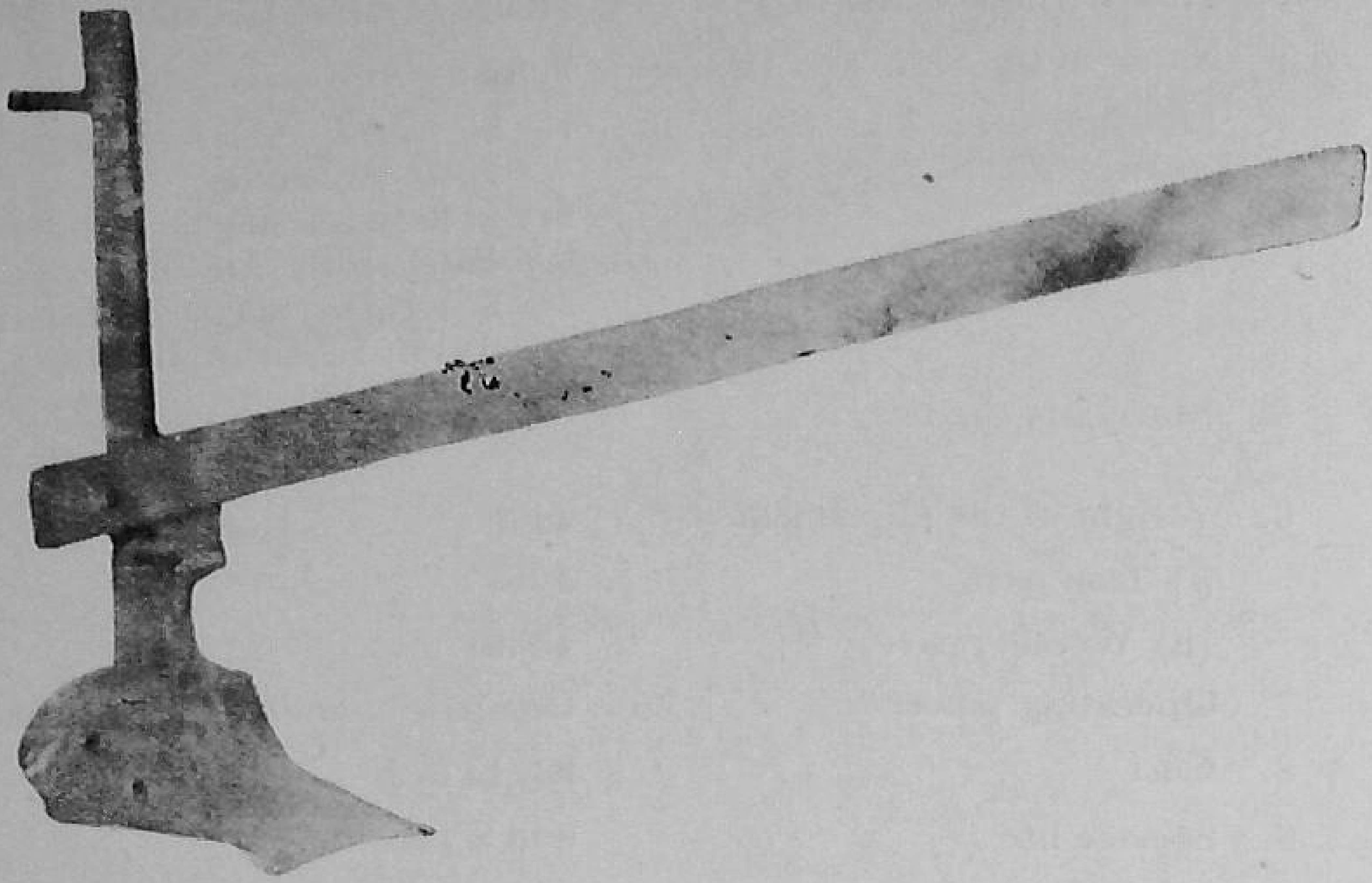


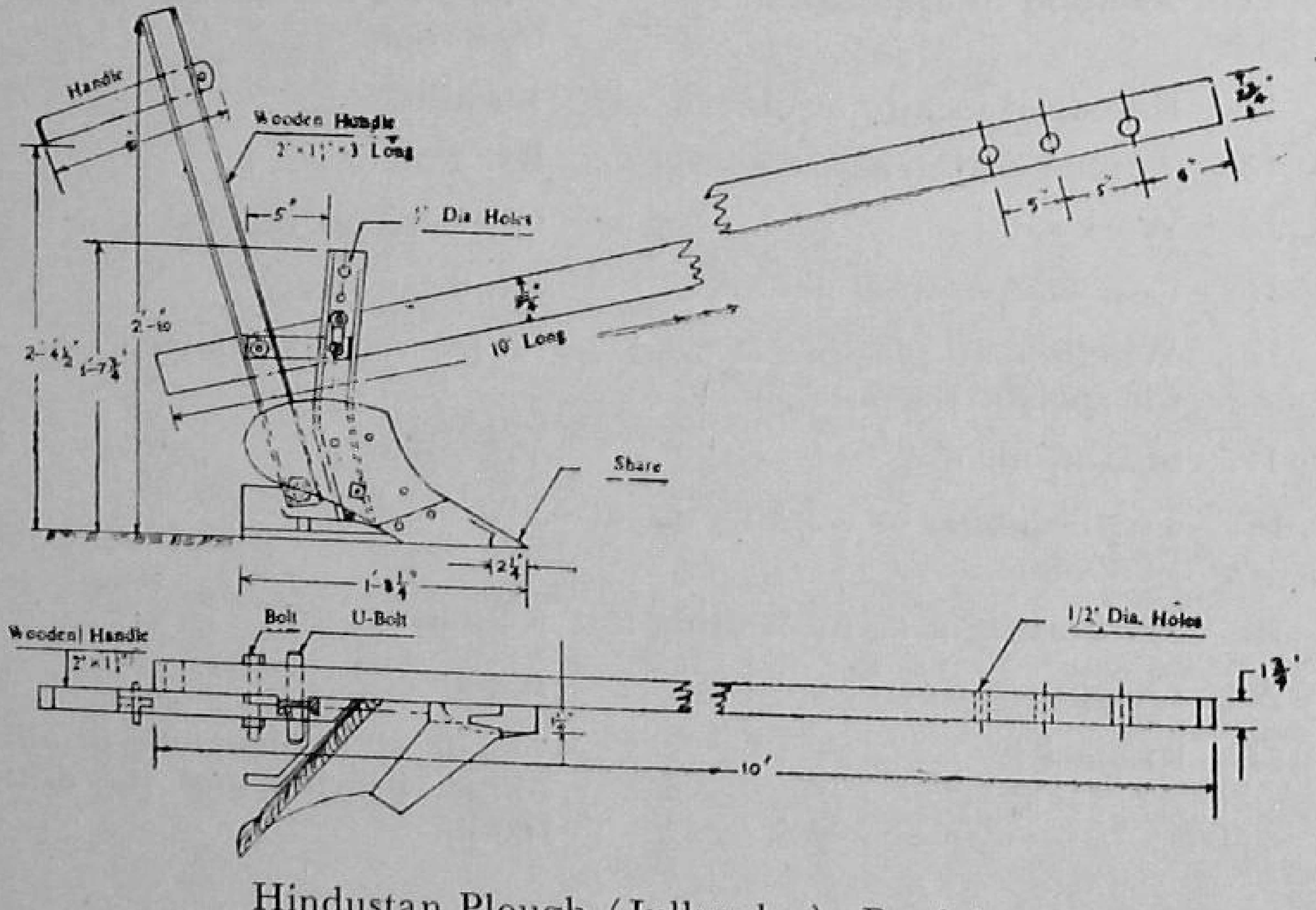
Plough (Jullundur) Punjab

PLOUGHS

Jullundari Hal (Punjab)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plough—Jullundari Hal
3.	Name of the State and District	Punjab—Amritsar, Jullundur
4.	Manufacturers and source of availability	1. S. Natha Singh Chogawan, Distt. Amritsar 2. S. Balwant Singh, Fabricator Fatehabad, (Amritsar). 3. S. Ujagar Singh, Fabricator, Taran Taran (Amritsar)
5.	Materials used	Sal, Shisham wood and steel
6.	Weight of the implement	43 lb.
	(i) Iron part	3 lb.
	(ii) Wooden part	40 lb.
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 14 to 15
9.	Service life	6 to 8 year
10.	Usage	It is used for seed bed preparation
11.	Method of application	The plough is hitched to the yoke by a rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 2.50 to Rs. 3
14.	Work rate	One acre per day
15.	Cost of operation per acre	Rs. 6
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season for use	Year round
18.	Total number of working days in a year	36 days
19.	Percentage of farmers using it	Nominal
20.	Origin	Indian
21.	Remarks	The depth of ploughing in alluvial soil is $7\frac{1}{2}$ inches, and the draft is 160 lb.



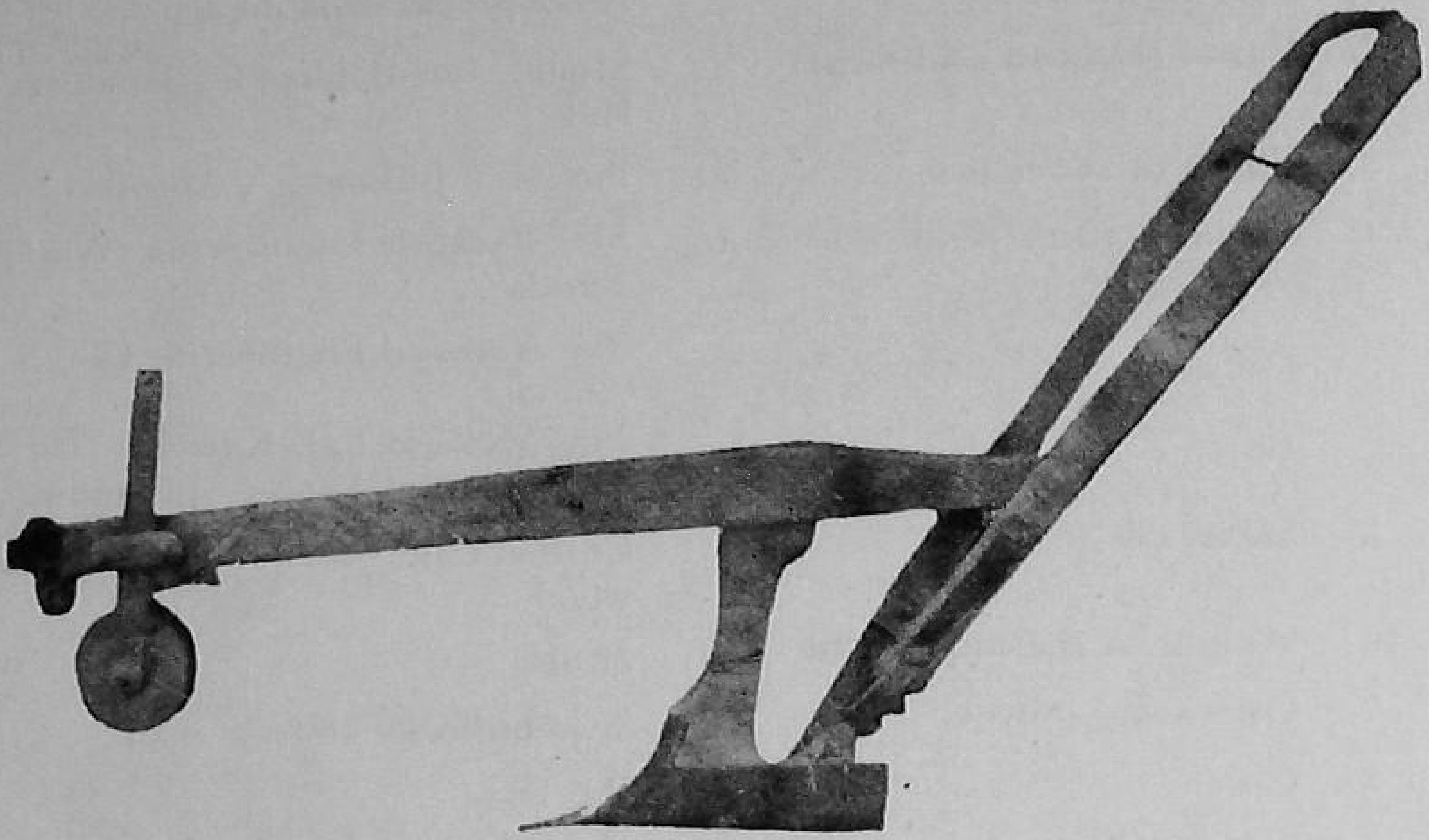


Hindustan Plough (Jullundur) Punjab

PLOUGHS

Hindustan Hal (Punjab)

1.	Classification	Land preparation implement
2.	Name (English and local)	Mould board plough - Hindustan Hal
3.	Name of the State and District	Punjab - Jullundur - Amritsar
4.	Manufacturers and source of availability	M/s Parkash Engineering Works, Batala M/s National Engineering Co. Ambala M/s Mukand Lal, Karnal M/s Watkins Mayor, Jullundur
5.	Materials used	Chilled C.I., C.I. M.S. and sal wood.
6.	Weight of the implement	56 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 25
9.	Service life	8 to 10 years
10.	Usage	For ploughing and seed bed preparation
11.	Method of application	The plough is hitched with a rope to the yoke
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 5
14.	Work rate	One acre per day
15.	Cost of operation per acre	Rs. 6
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	Nominal
20.	Origin	Foreign
21.	Remarks	It is used on the Departmental Agricultural Farms. As regards private farms, only progressive farmers are using. The draft is 40 lb. The depth and width is 6 inches to 7½ inches.



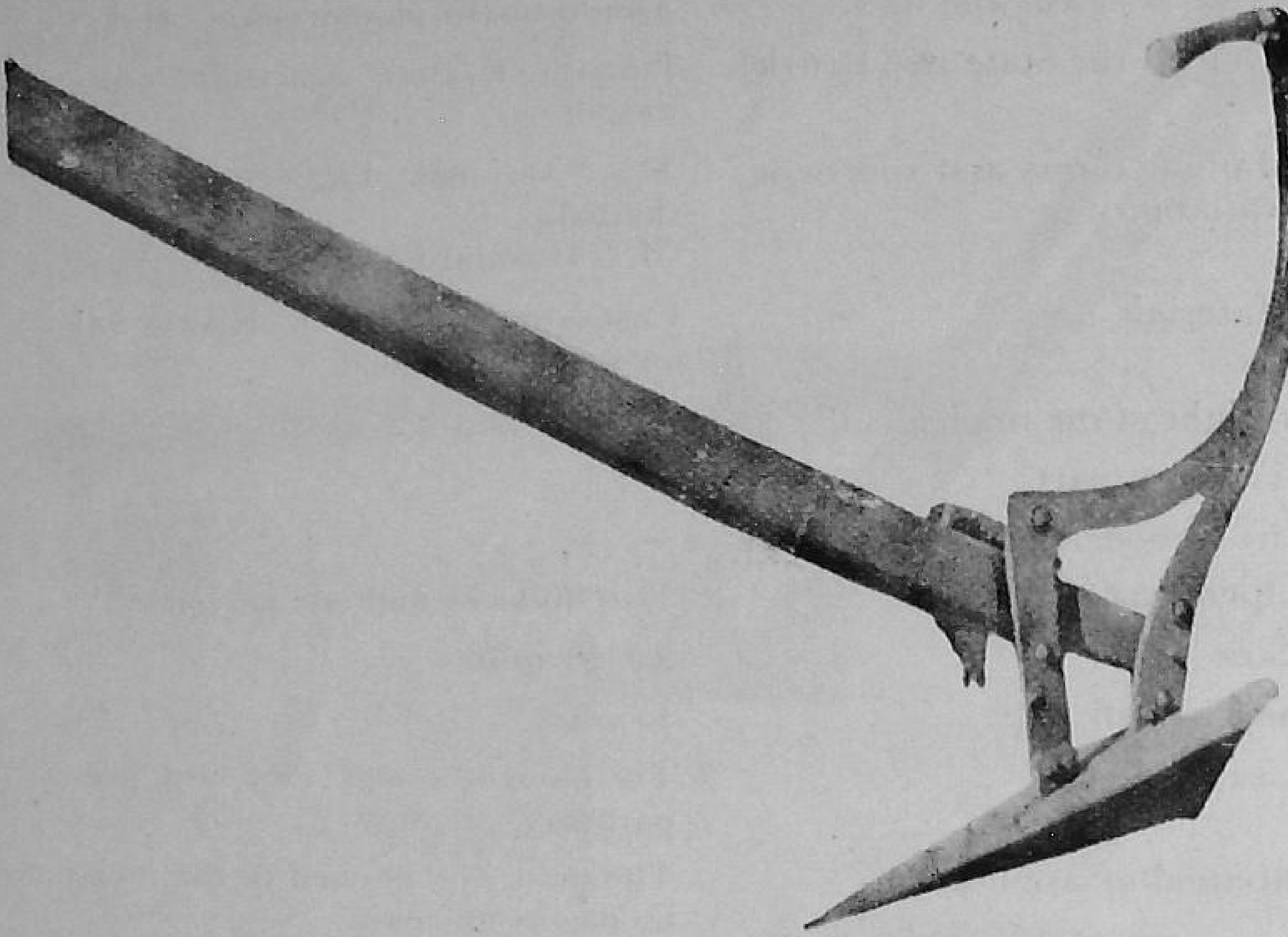
Raja Hal (Karnal) Punjab

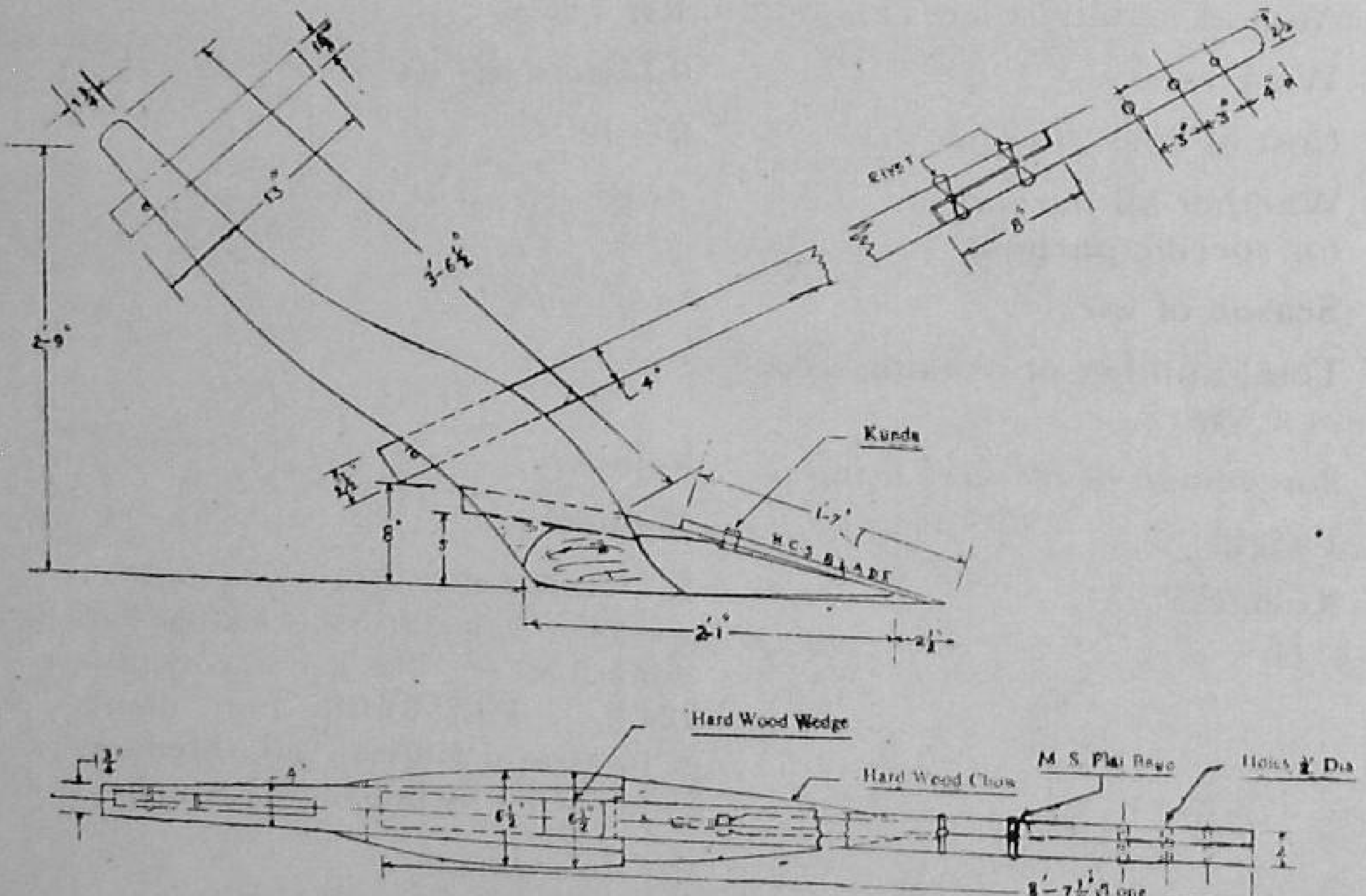
PLOUGHS

Raja Hal (Punjab)

1.	Classification	Land preparation implement
2.	Name (English and local)	Mould board plough—Raja Hal
3.	Name of the State and District	Punjab - Karnal, Amritsar, Gurdaspur
4.	Manufacturers and source of availability	M/s National Engineering Co., Ambala M/s Mukand Lal, Karnal
5.	Materials used	Cast Iron, mild steel, Kikar, Sal and Shisham wood
6.	Weight of the implement	—
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one person
8.	Cost	Rs. 60 to 70
9.	Service life	10 years
10.	Usage	For ploughing and seed bed preparation
11.	Method of application	The plough is hitched to the yoke by means of chain
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 7 to 8
14.	Work rate	0.75 acre per day
15.	Cost of operation per acre	Rs. 10.75
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17-	Season of use	Year round
11.	Total number of working days in a year	—
19.	Percentage of farmers using it	Nominal
20.	Origin	Foreign
21.	Remarks	It is mostly used on departmental Agricultural Farms in Punjab State. The average draft is 224 lb. The width and depth of furrow in alluvial soil (Medium loam) are 9 inches and 5½-6 inches.

PLATE 31



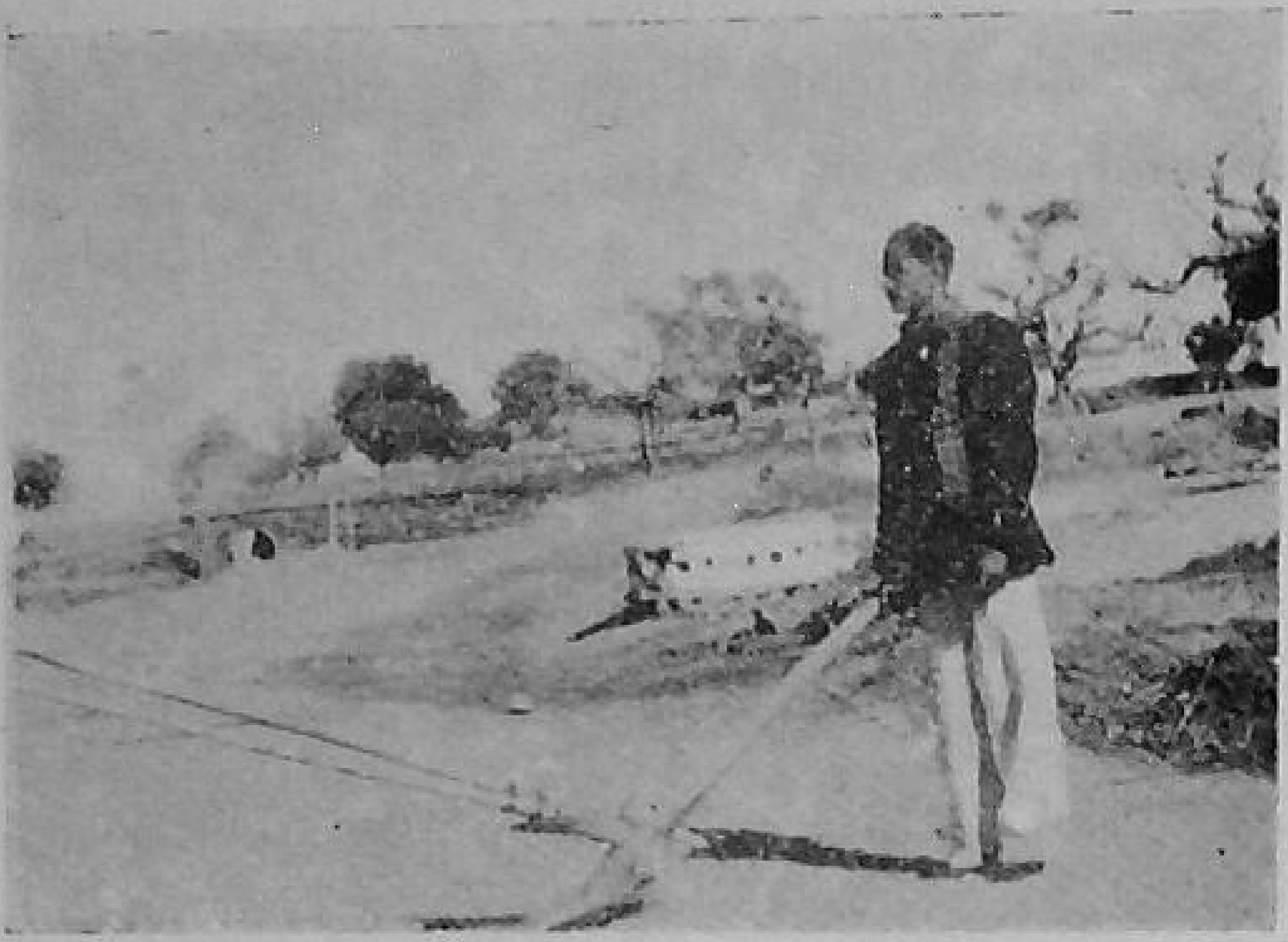


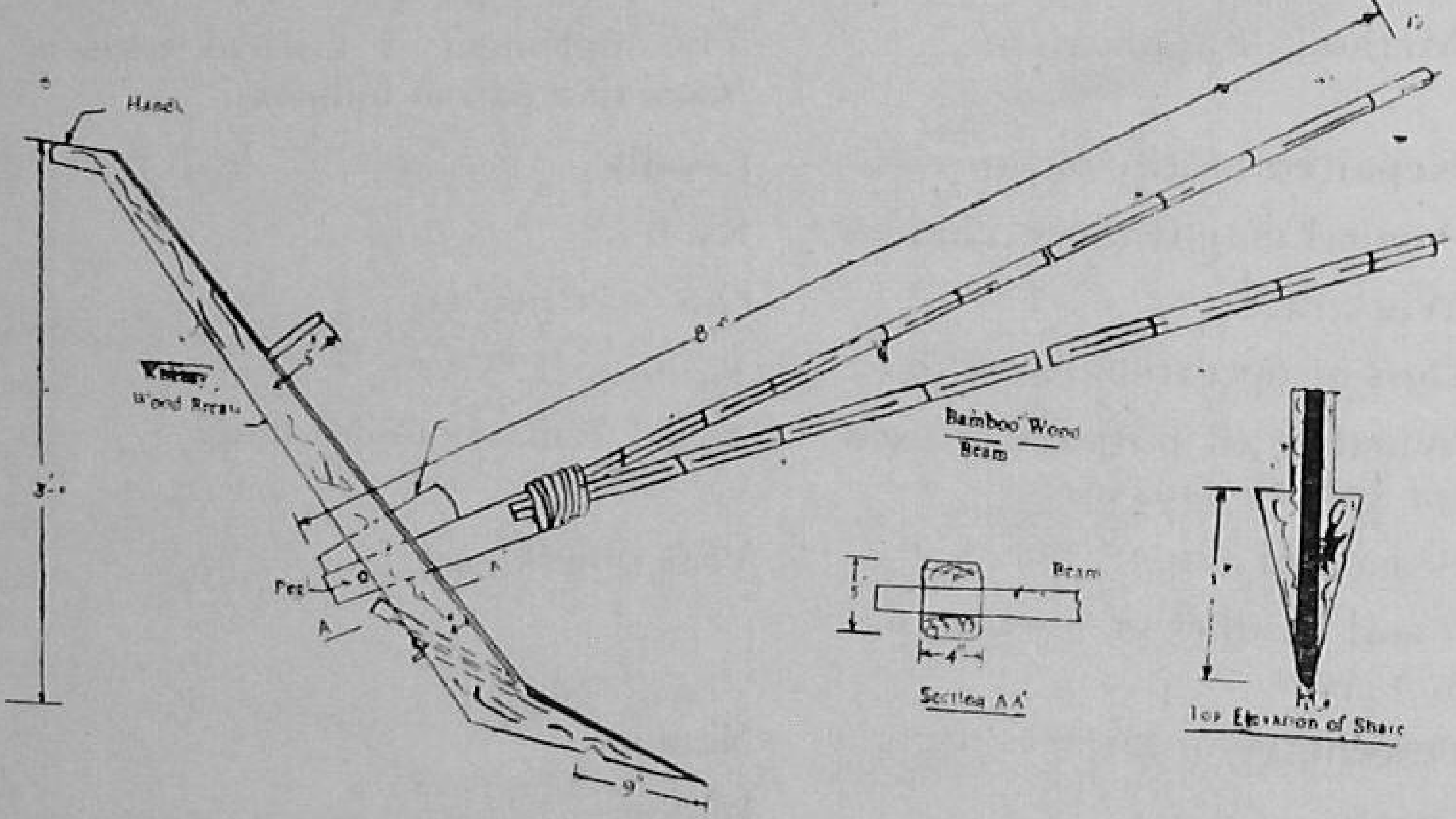
Wooden Muna Plough (Jullundur) Punjab

PLOUGHS

Muna Hal (Punjab)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plough—Muna Hal with steel body
3.	Name of the State and District	Punjab—Jullundur
4.	Manufacturers and source of availability	Mistri Nand Singh—Agricultural Inspector, Giddarbaha and local artisans
5.	Materials used	Shisham, Kikar, Sal wood and mild steel
6.	Weight of the implement	42 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 15
9.	Service life	10 years
10.	Usage	For seed bed preparation
11.	Method of application	The implement is hitched with a beam to a pair of bullocks
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 6
14.	Work rate	One acre per day
15.	Cost of operation per acre	Rs. 6
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	Nominal
20.	Origin	Indian
21.	Remarks	The draft is 168 lb. The depth of ploughing in alluvial soil is 4 inches and width 9 inches.





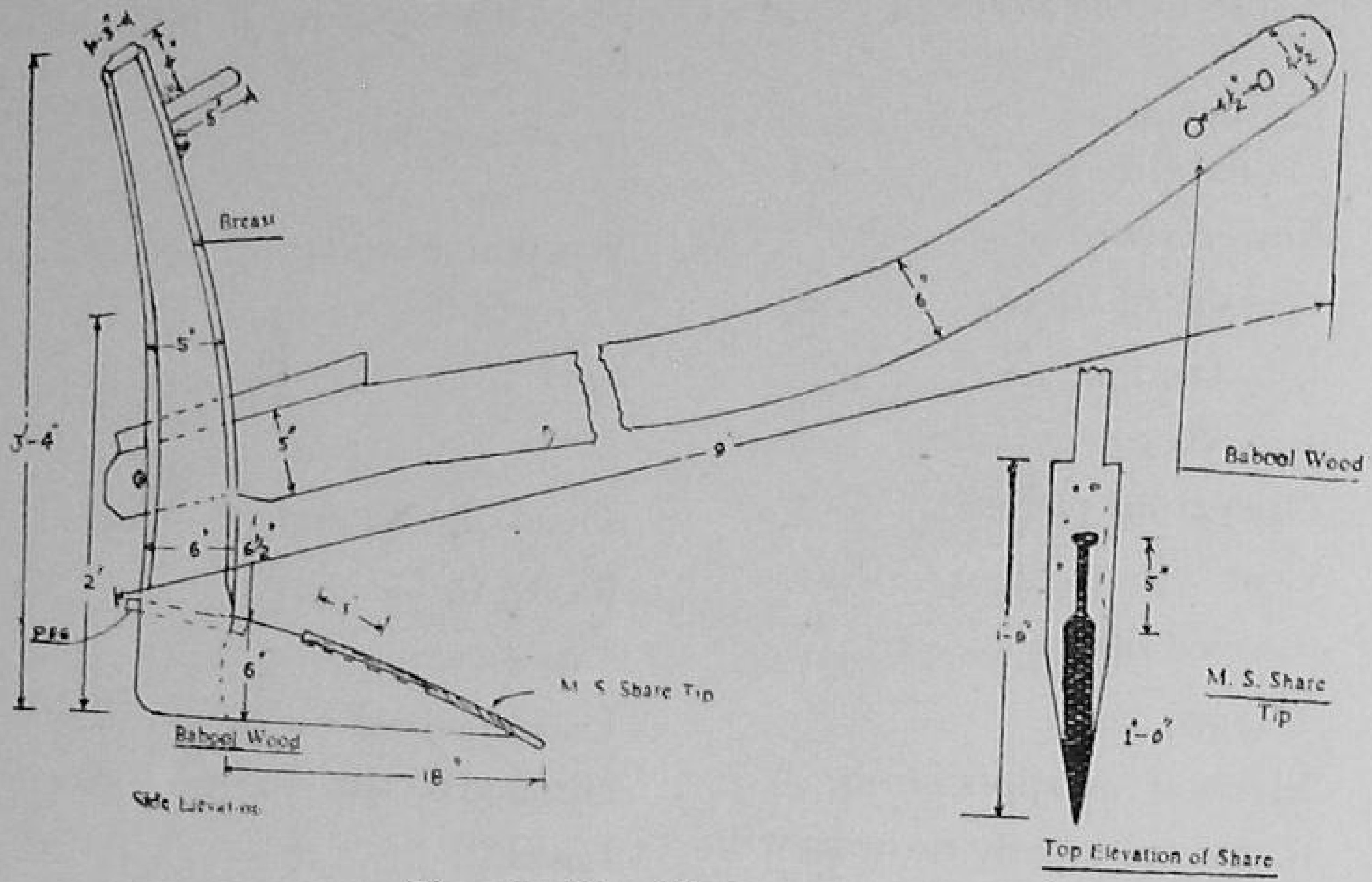
Plough (Sikar) Rajasthan

PLOUGHS

Hal (Rajasthan)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plough—Hal
3.	Name of the State and District	Rajasthan—Sikar, Jhunjhunu and Bhilwara
4.	Manufacturers and source of availability	Local artisans
5,	Materials used	Wood and mild steel
6.	Weight of the implement	23 to 42 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 12 to 13
9.	Service life	3 to 4 years
10.	Usage	Used for seed bed preparation
11.	Method of application	Hitched to the yoke by ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 2 to 4
14.	Work rate	1 acre per day
15.	Cost of operation per acre	Rs. 4
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	*Kharif*
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	The depth of ploughing in sandy soils is 5 to 6 inches and the width 4 to 5 inches. The average draft is 120-180 lb.

PLATE 33

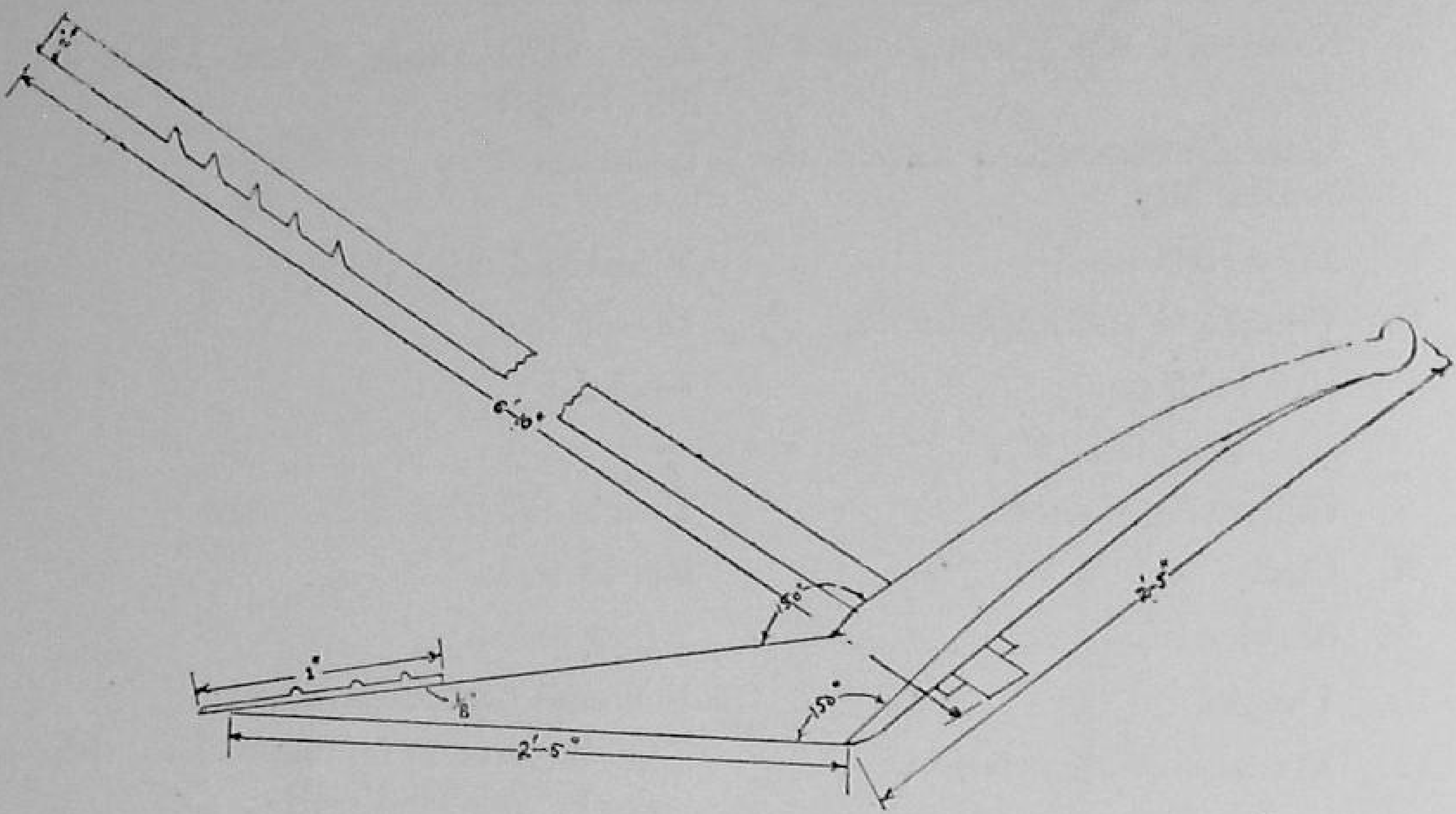


Plough (Tonk) Rajasthan

PLOUGHS

Hal (Rajasthan)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plough—Hal
3.	Name of the State and District	Rajasthan—Tonk, Sawai Madhopur, Kotah
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Wood and mild steel
6.	Weight of the implement	48—62 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 13 to 15
9.	Service life	2 to 3 years
10.	Usage	For seed bed preparation
11.	Method of application	The implement is hitched to the yoke by means of ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 2 to 3
14.	Work rate	0.75 to 0.90 acre per day
15.	Cost of operation per acre	Rs. 4 to 5.50
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	Used in sandy and clay loam soils. The depth and width of ploughing are 5 and 6 to 8 inches respectively. The draft is 170-180 lb. on an average.

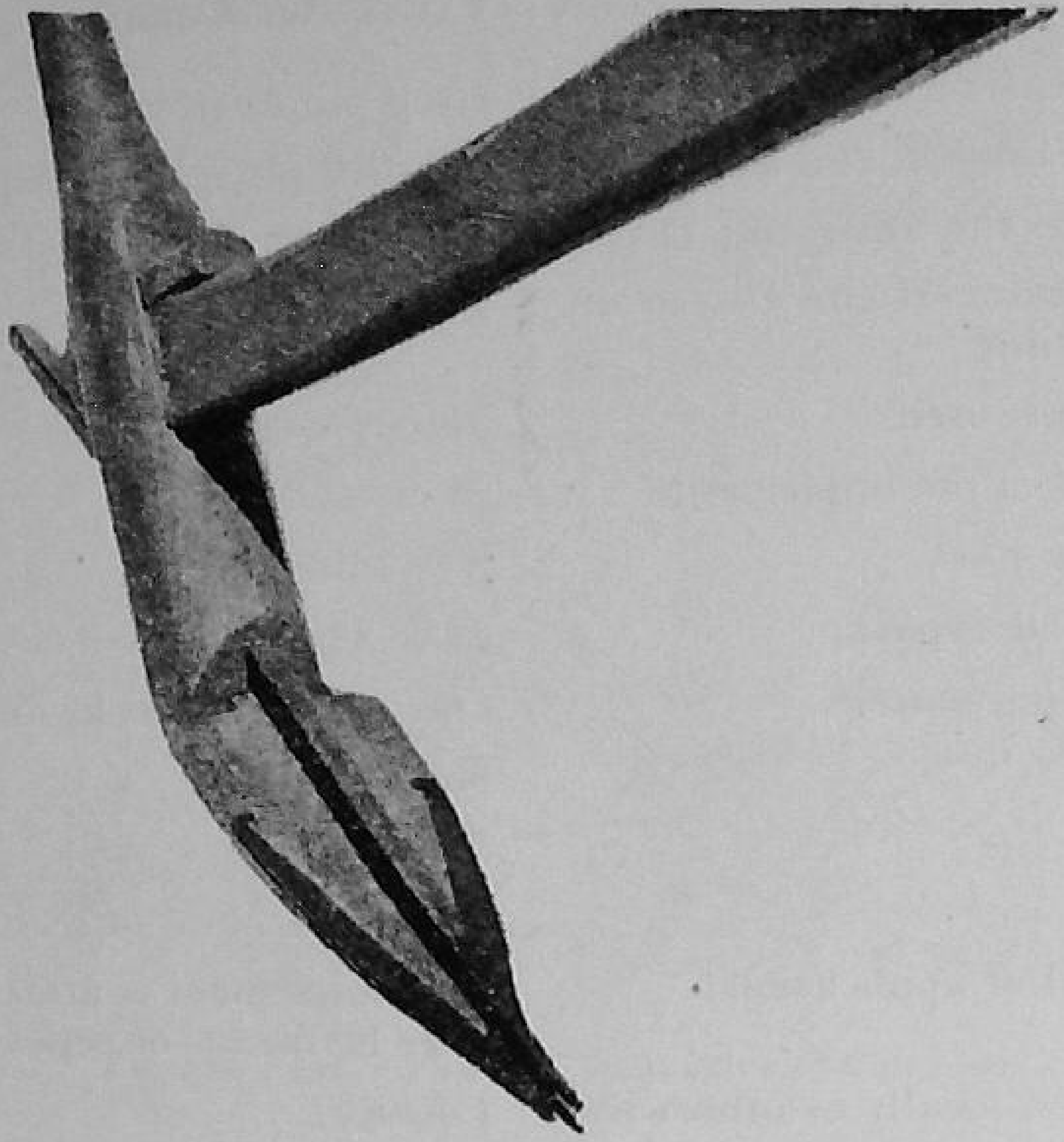


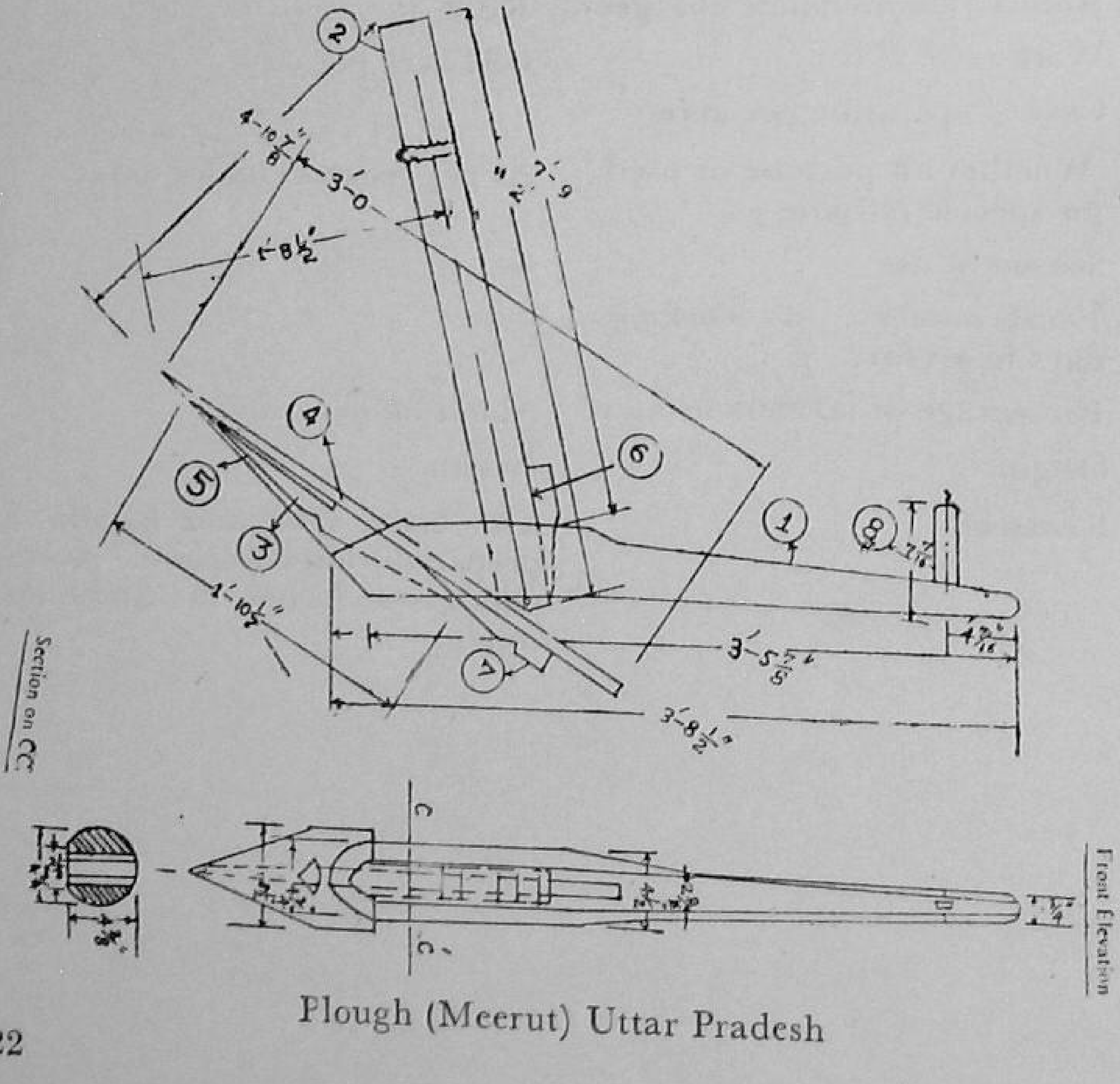
Plough (Trivandrum) Travancore-Cochin

PLOUGHS

Kalappa—Plough (Travancore-Cochin)

1.	Classification	Land preparation implement
2.	Name (English and local)	Country plough—Kalappa
3.	Name of the State and District	Travancore Cochin—Trivandrum
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Mango wood and mild steel
6.	Weight of the implement	25 to 40 lb.
	(i) Iron part	2 to 3 lb.
	(ii) Wooden part	23 to 37 lb.
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 7 to 10
9.	Service life	2 years
10.	Usage	For preparation of seed bed
11.	Method of application	This implement is attached to the yoke by means of ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 1
14.	Work rate	0.33 acre per day
15.	Cost of operation per acre	
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year.	—
19.	Percentage of farmers using it	About 95 per cent
20.	Origin	Indian
21.	Remarks	The body, shoe and handle are prepared from one piece. Average depth is 4 inches in sandy loam soils.



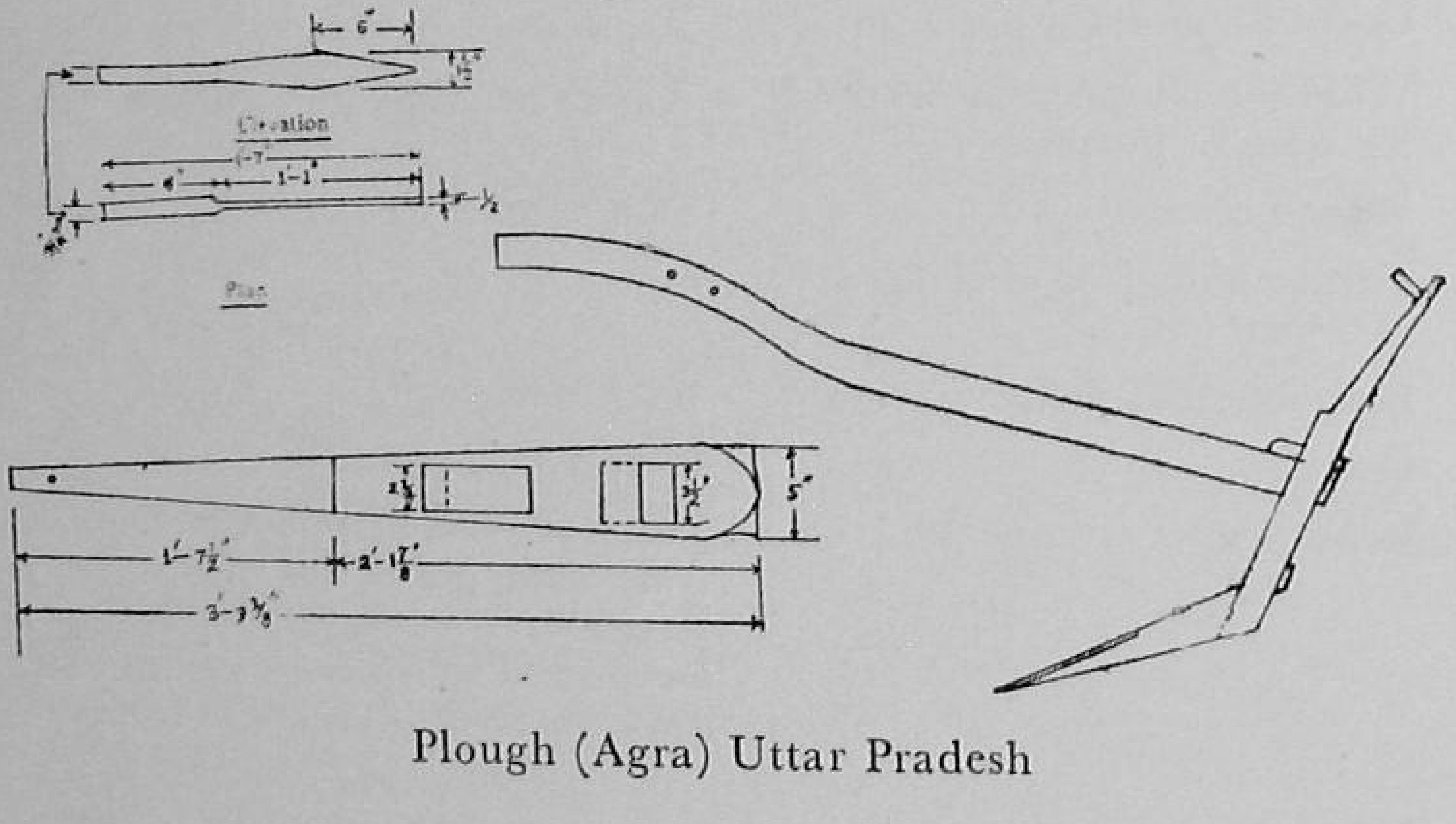


Plough (Meerut) Uttar Pradesh

PLOUGHS

Hal (Uttar Pradesh)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plough—Hal
3.	Name of the State and District	Uttar Pradesh—Meerut
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Babul, Sal, Shisham wood and mild steel
6.	Weight of the implement	40 lb.
	(i) Iron part	6½ lb.
	(ii) Wooden part	33½ lb.
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 17
9.	Service life	5 years
10.	Usage	For preparation of seed bed
11.	Method of application	The implement is fixed to a yoke by rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 2 to 4
14.	Work rate	0.8 to 1 acre per day
15.	Cost of operation per acre	Rs. 8
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	The body and handle are prepared from one piece but the shoe is separate. Average depth is 5 inches and width 5—6 inches. The draft is 185 lb. in alluvial soils.

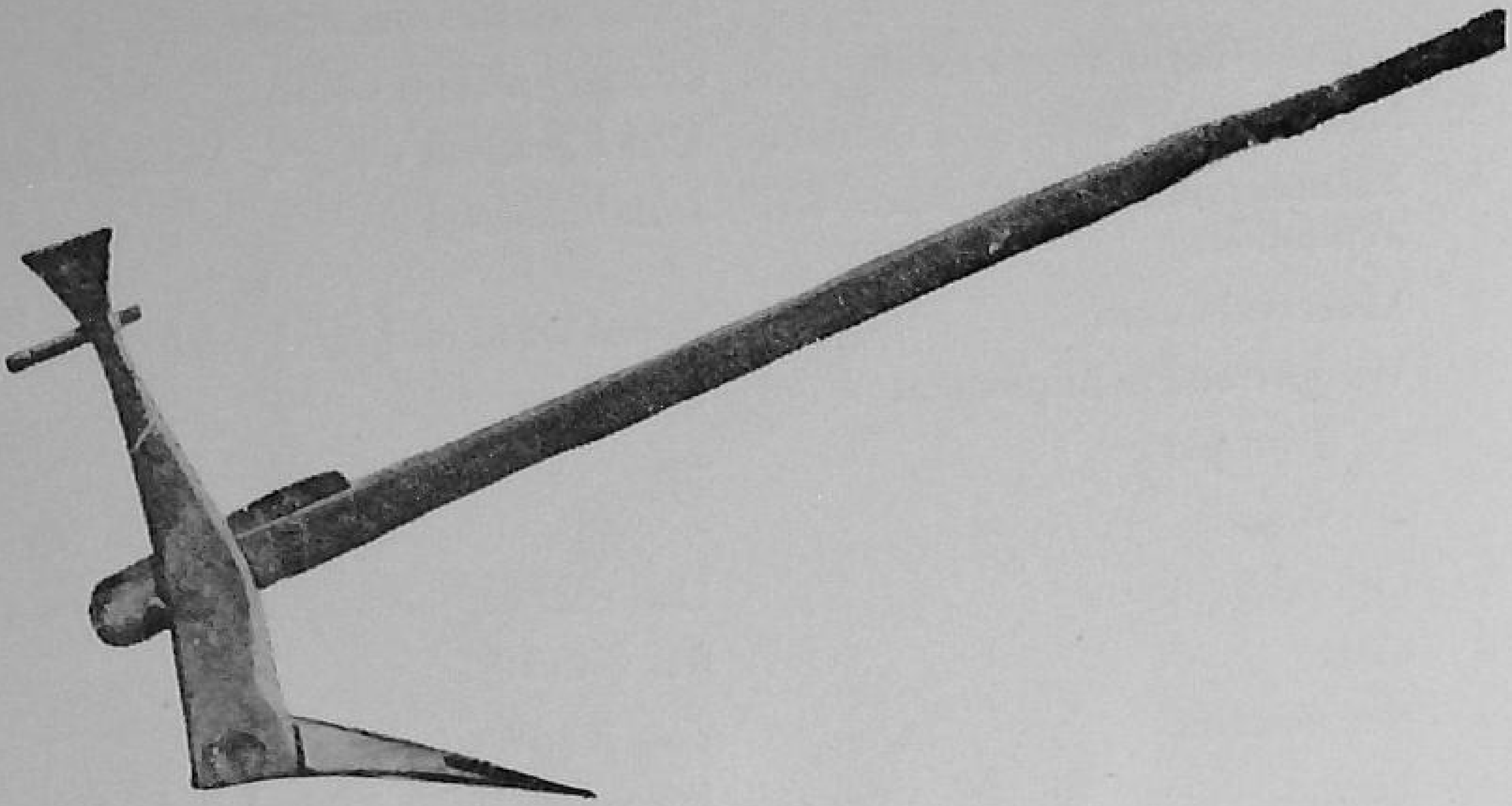


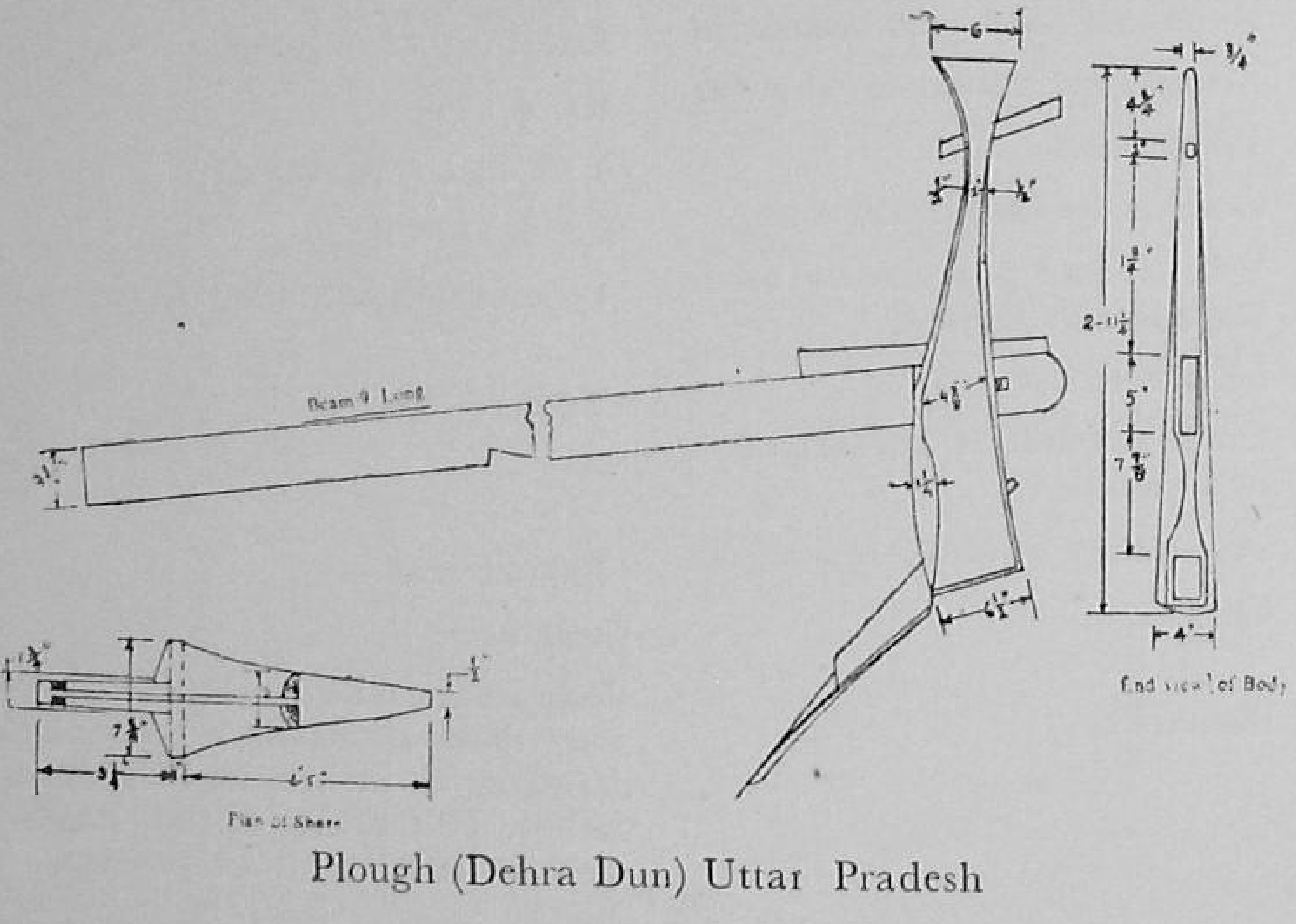
Plough (Agra) Uttar Pradesh

PLOUGHS

Hal (Uttar Pradesh)

1.	Classification	Land preparation implement
2.	Name (English and local)	Country plough - Hal
3.	Name of the State and District	Uttar Pradesh - Agra, Azamgarh
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Babul wood and mild steel
6.	Weight of the implement	40 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 6 to 10
9.	Service life	2 to 5 years
10.	Usage	For preparation of seed bed
11.	Method of application	The implement is fixed to the centre of the yoke by rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 4 to 5
14.	Work rate	0.50 to 1 acre per day
15.	Cost of operation per acre	Rs. 6.50 to 8
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	Body and handle are in one piece and shoe is separate. Average depth is 4 inches and width 5 inches. The draft of the implement is 180 lb. on an average.





Plough (Dehra Dun) Uttar Pradesh

PLOUGHS

Hal (Uttar Pradesh)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plough—Hal
3.	Name of the State and District	Uttar Pradesh - Dehra Dun
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Wood and mild steel
6.	Weight of the implement	24 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One pair of bullocks and one person
8.	Cost	Rs. 9
9.	Service life	4 years
10.	Usage	For preparation of seed bed
11.	Method of application	The implement is tied to the centre of the yoke by a rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 1
14.	Work rate	0.5 acre per day
15.	Cost of operation per acre	Rs. 13
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	The body and handle are prepared in one piece and shoe is separate. Average depth of furrow is 4 inches and width 4-5 inches in alluvial soils. The draft of this implement is 224 lb.

SECTION III

HARROWS IN USE IN DIFFERENT STATES

HARROWS

The 'Harrow' is mainly used as a secondary tillage implement. It supplements the work of a plough for preparing the seed bed for crops and for covering the seeds after sowing. The object of harrowing is to obtain a proper tilth of soil. Tyned and peg-tooth harrows are useful for collection of trash, and are also used for thinning as well as intercultivation of row-crops. The usual working depth is 2 to 3 inches below the soil surface.

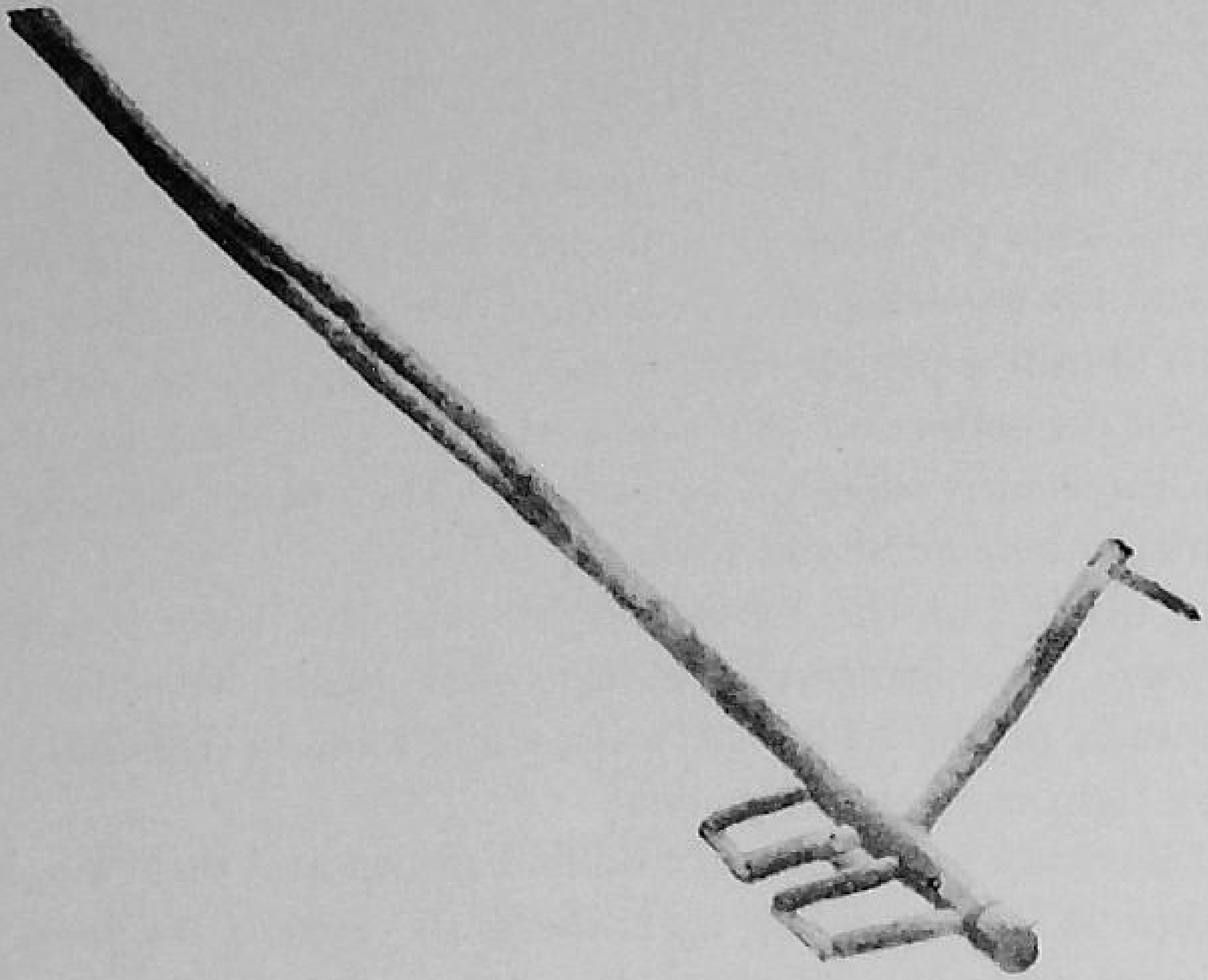
The blade and the toothed types are the most common forms of harrows. It is interesting to note that blade harrows (DRG 22) are generally preferred in clay soils, while toothed (DRG 21) are preferred in lighter or gravelly soils.

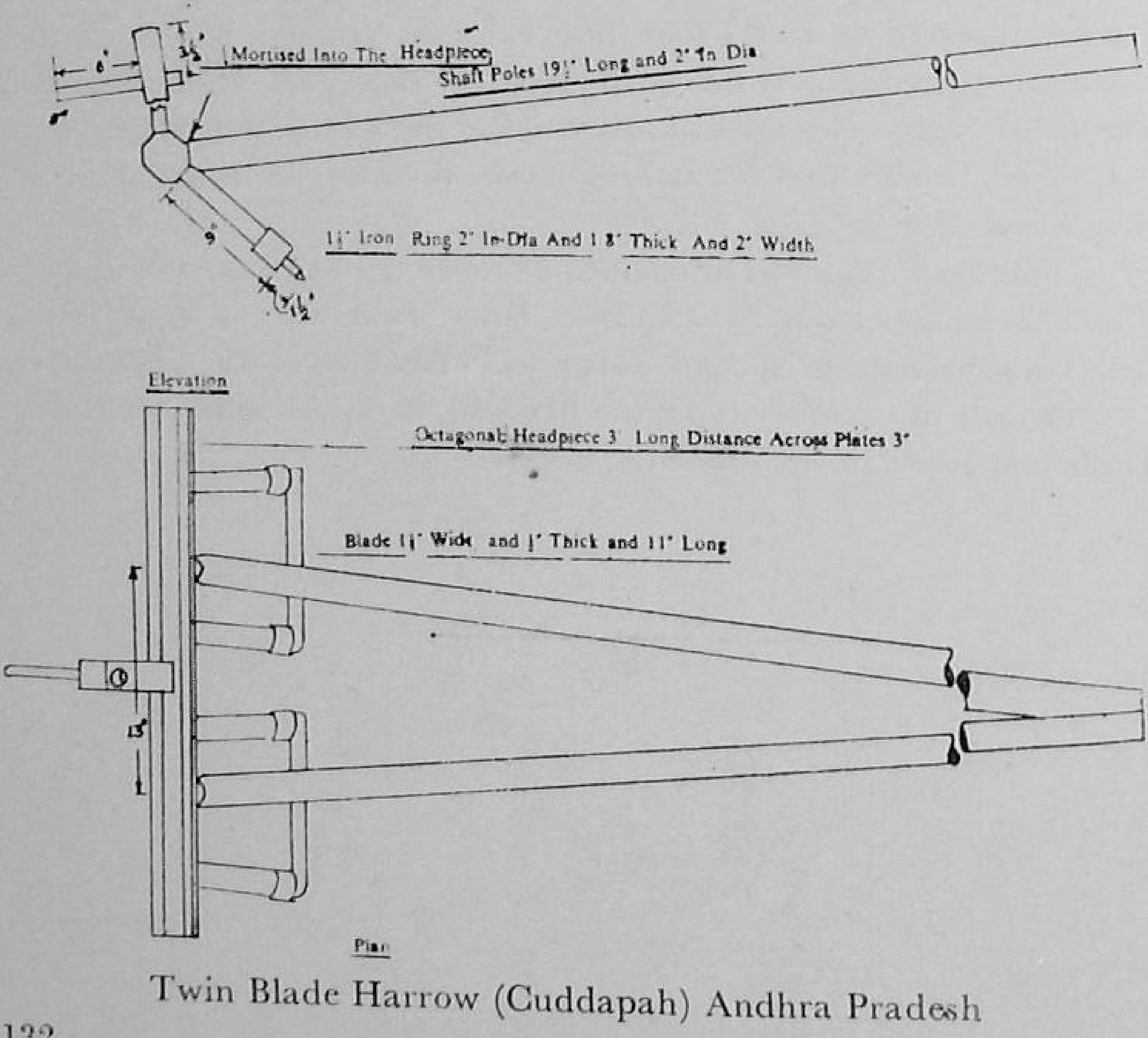
All harrows are invariably bullock drawn and their weight ranges from 30 to 90 lb. depending upon the draft capacity of local animals. Only Coorg State has reported the use of hand harrow (DRG 27) which consists of a beam of hard wood nearly 5 feet long with wooden spikes inserted in it at 1 foot interval. A bamboo handle facilitates manual operation. It has been reported that this implement breaks the clods, pulverises the soil and collects the weeds previously uprooted. This is also used for making cross furrows at a distance of 10 to 14 inches.

The draft required to operate harrows varies from 190 to 240 lb. The cost ranges from Rs. 5 to 25. Their useful life is 2 to 6 years. The maintenance charges range from Re. 0.50 to Rs. 3 per annum.

Details of various types of harrows in use in different States of India are given in the following pages.

PLATE 38

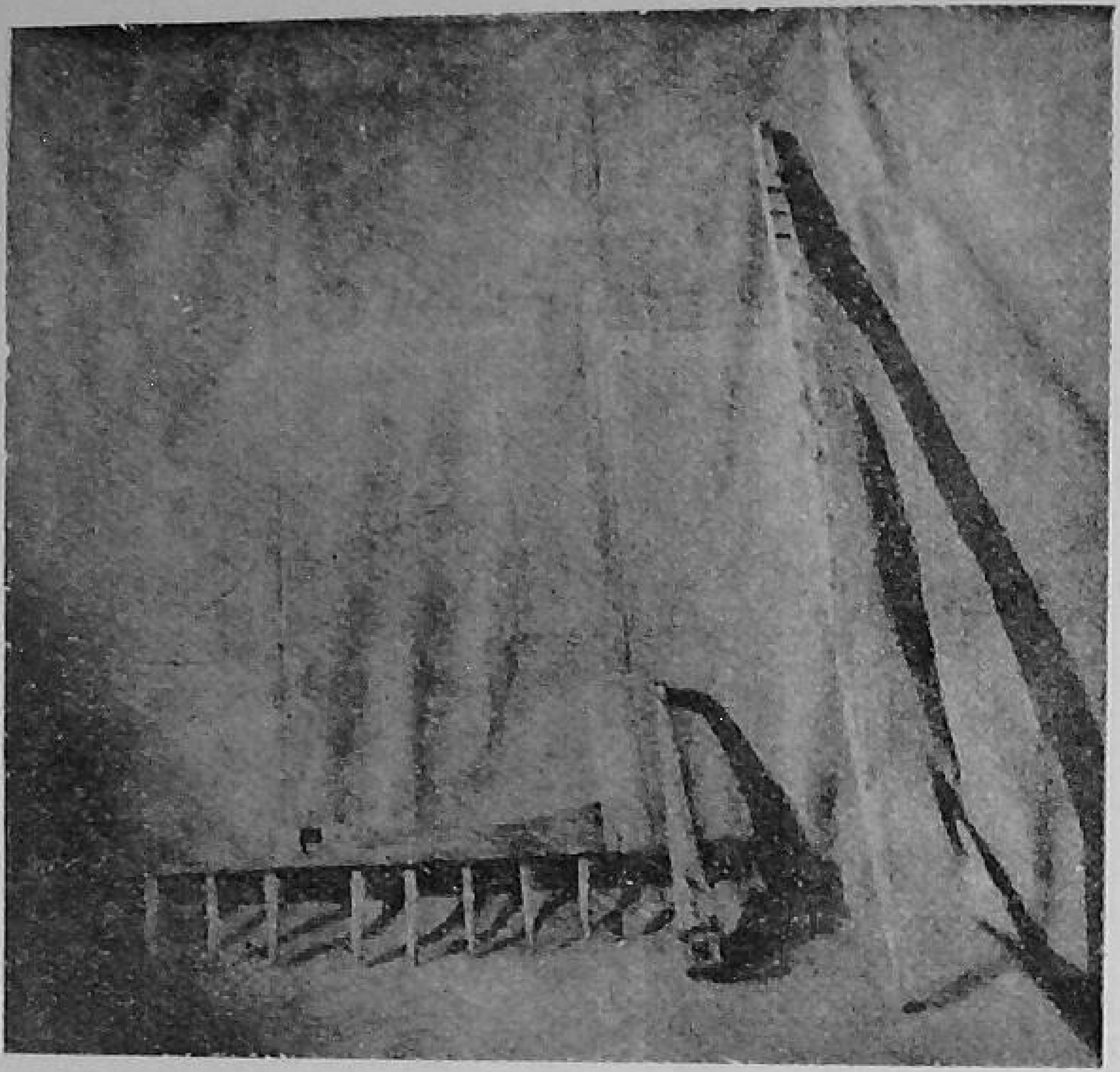


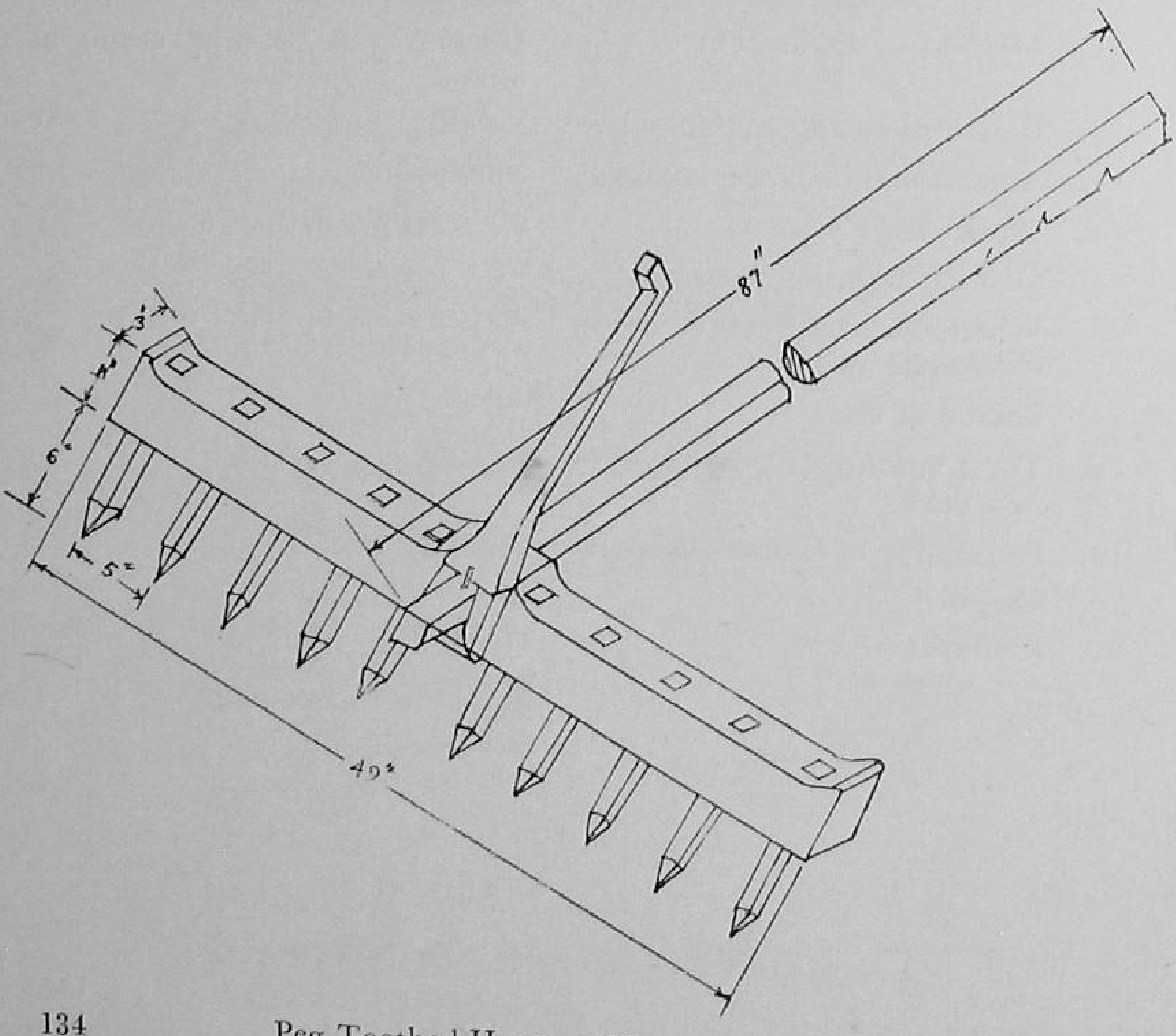


Twin Blade Harrow (Cuddapah) Andhra Pradesh

TWIN BLADE HARROW—BODELA (ANDHRA PRADESH)

1.	Classification	Interculture implement
2.	Name (English and local)	Twin blade harrow—Bodela
3.	Name of the State and District	Andhra—Cuddapah, Kurnool
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Babul, red sander waod and mild steel
6.	Weight of the implement	56—57 lb.
	(i) Iron Part	10 lb.
	(ii) Wooden part	46—47 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 12
9.	Service life	4—5 years
10.	Usage	For digging the pods of the spreading variety of groundnut, and for seed bed preparation
11.	Method of application	Hitched to the yoke by means of a rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	3.5 acres per day
15.	Cost of operation per acre	—
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 40 per cent
20.	Origin	Indian
21.	Remarks	The draft in black and red soils varies from 250—280 lb. The depth of harrowing is 4 —5 inches.





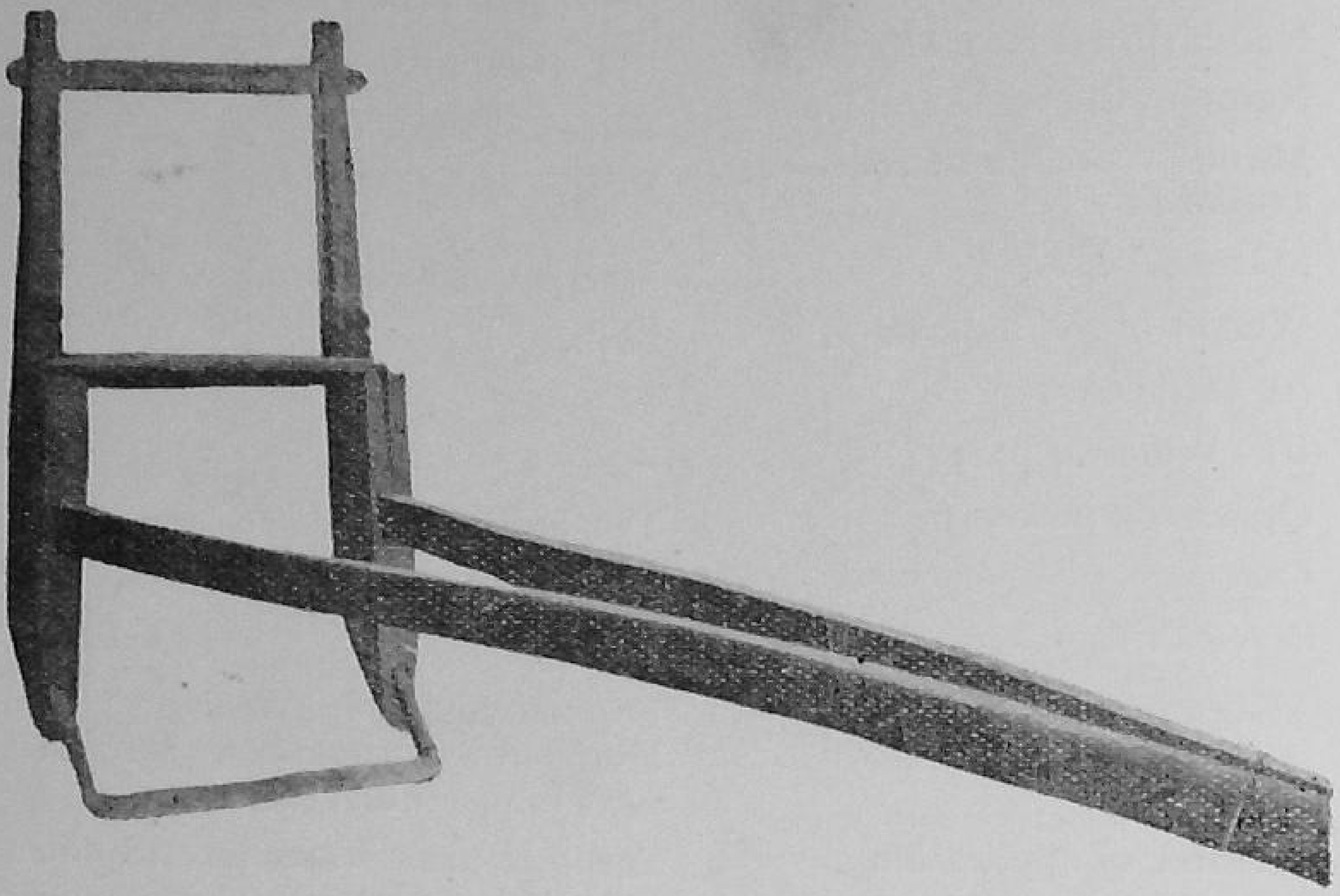
Peg Toothed Harrow (Nowgong) Assam

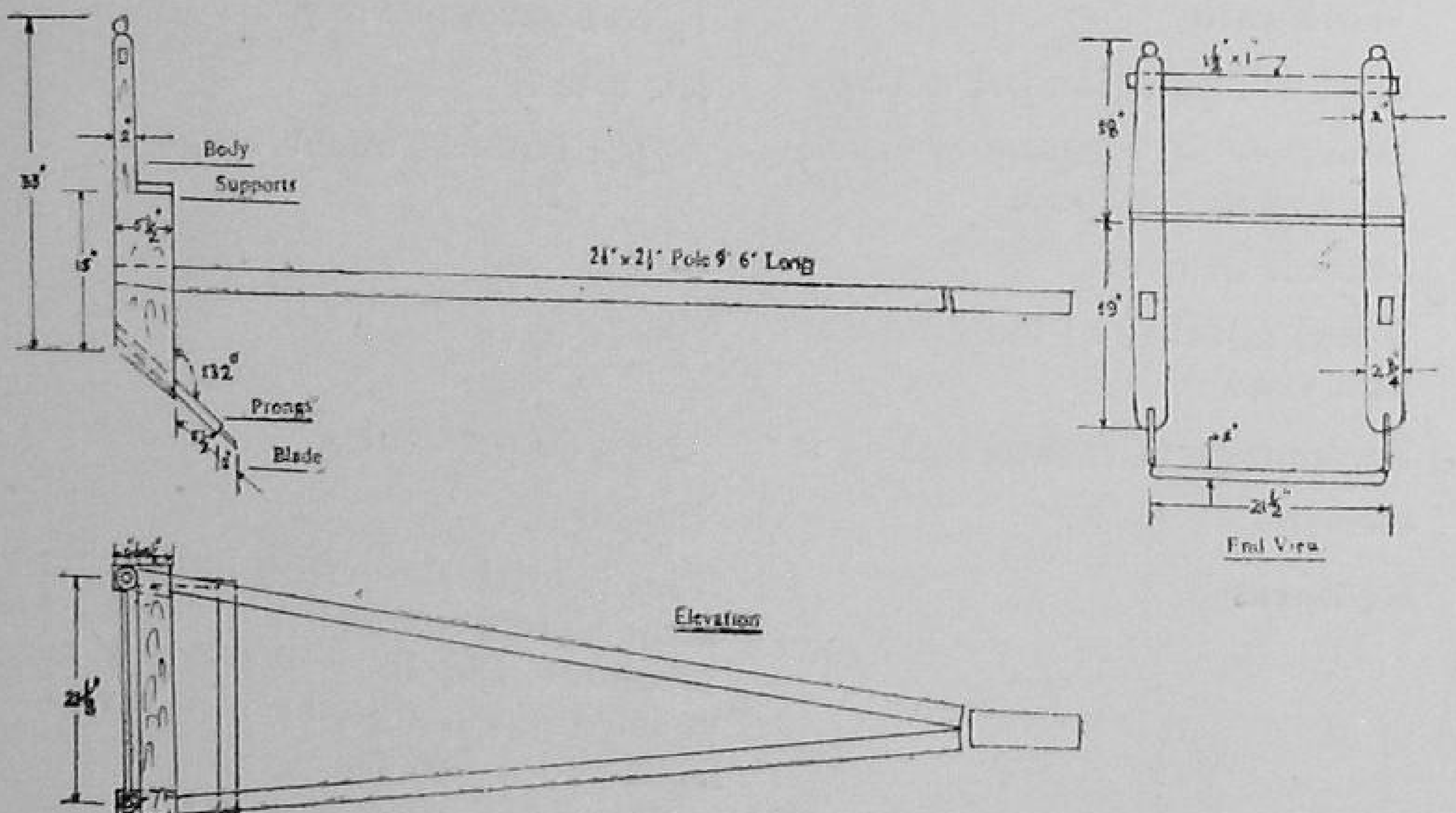
HARROWS

Peg Toothed Harrow—Bindha (Assam)

1.	Classification	Land preparation implement
2.	Name (English and local)	Peg toothed harrow—Bindha
3.	Name of the State and District	Assam—Nowgong
4.	Manufacturers and source of availability	Village artisans
5,	Materials used	Mango wood and bamboo
6.	Weight of the implement	24 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one person
8.	Cost	Rs. 8 to 10
9.	Service life	2 years
10.	Usage	For collecting dried weeds and for interculture operations between rows in paddy and jute crops
11.	Method of application	The implement is attached to the yoke by a rope.
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	1½ to 2 acres per day
15.	Cost of operation per acre	Rs. 4 to 5
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	12—13 days
19.	Percentage of farmers using it	About 80 per cent
20.	Origin	Indian
21.	Remarks	This is used for cross harrowing also. The average draft required is about 130 lb. The depth of penetration in alluvial soil varies from 2 to 4 inches.

PLATE 40





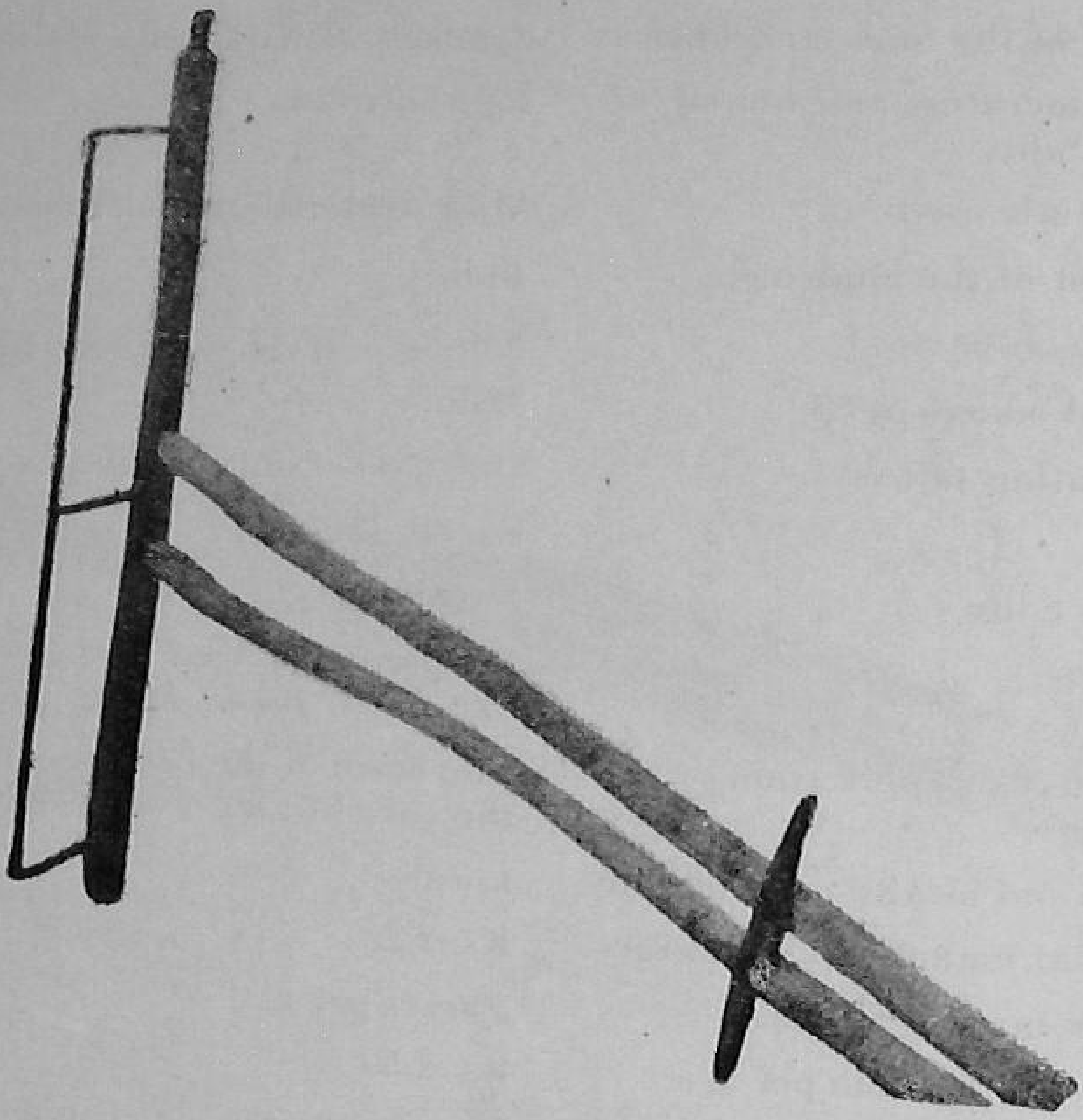
Blade Harrow (Sabarkantha) Bombay

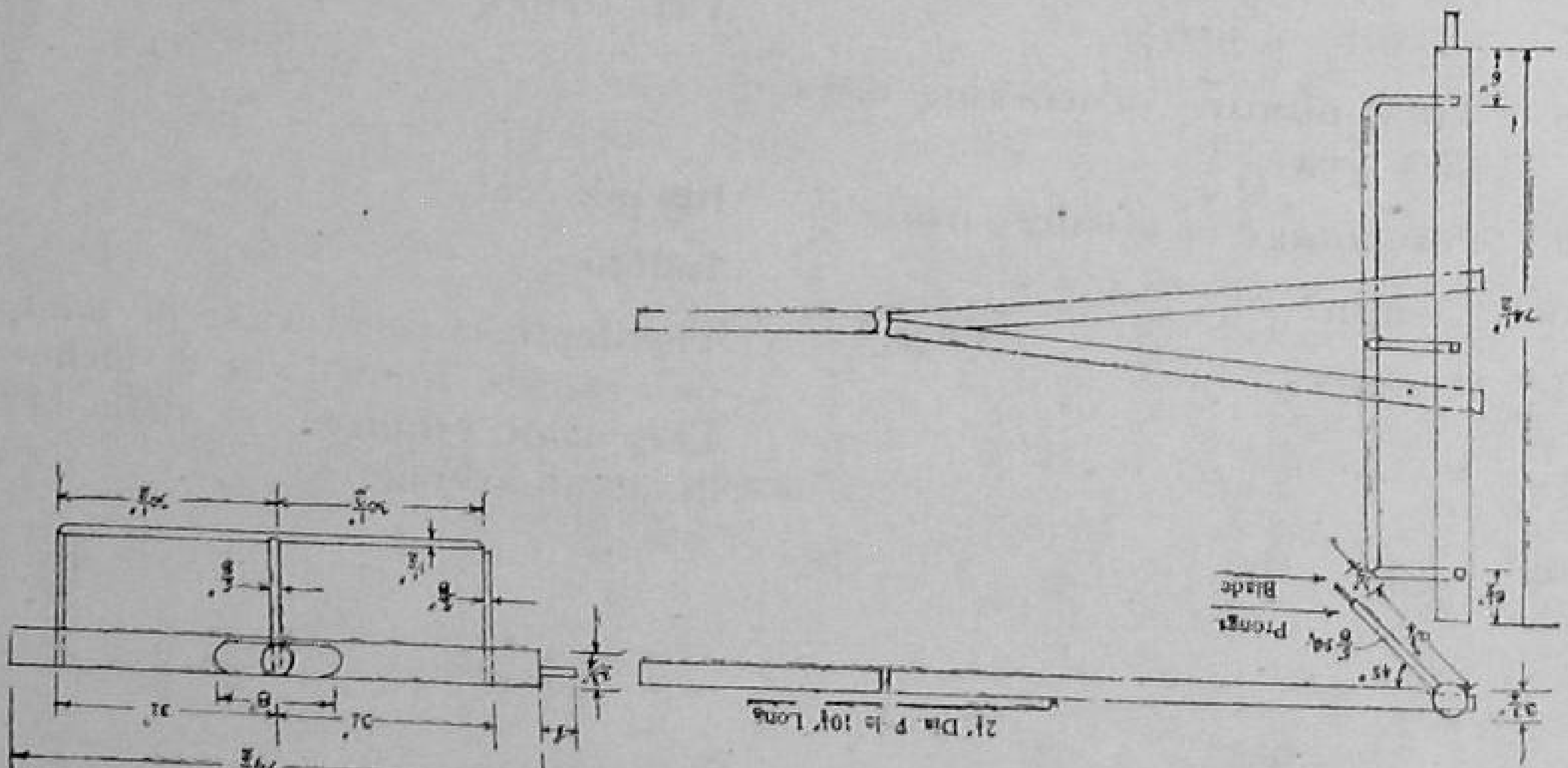
HARROWS

Entire Blade Harrow (Bombay)

1.	Classification	Land preparation implement
2.	Name (English and local)	Entire blade harrow—Karala
3.	Name of the State and District	Bombay—Sabarkantha
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Mild steel, Babul and Teak wood
6.	Weight of the implement	40 lb.
	(i) Iron part	8 lb.
	(ii) Wooden part	32 lb.
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 20
9.	Service life	5 years
10.	Usage	For preparing seed bed of crops like *Bajri, Jowar, Mung*
11.	Method of application	The beam of the harrow is tied to the yoke by means of a rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 2.25
14.	Work rate	3 acres per day
15.	Cost of operation per acre	Rs. 2.50
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	The depth of penetration in sandy soil ranges from 1 to 2 inches. The draft required is about 112 lb. on an average.

PLATE 41





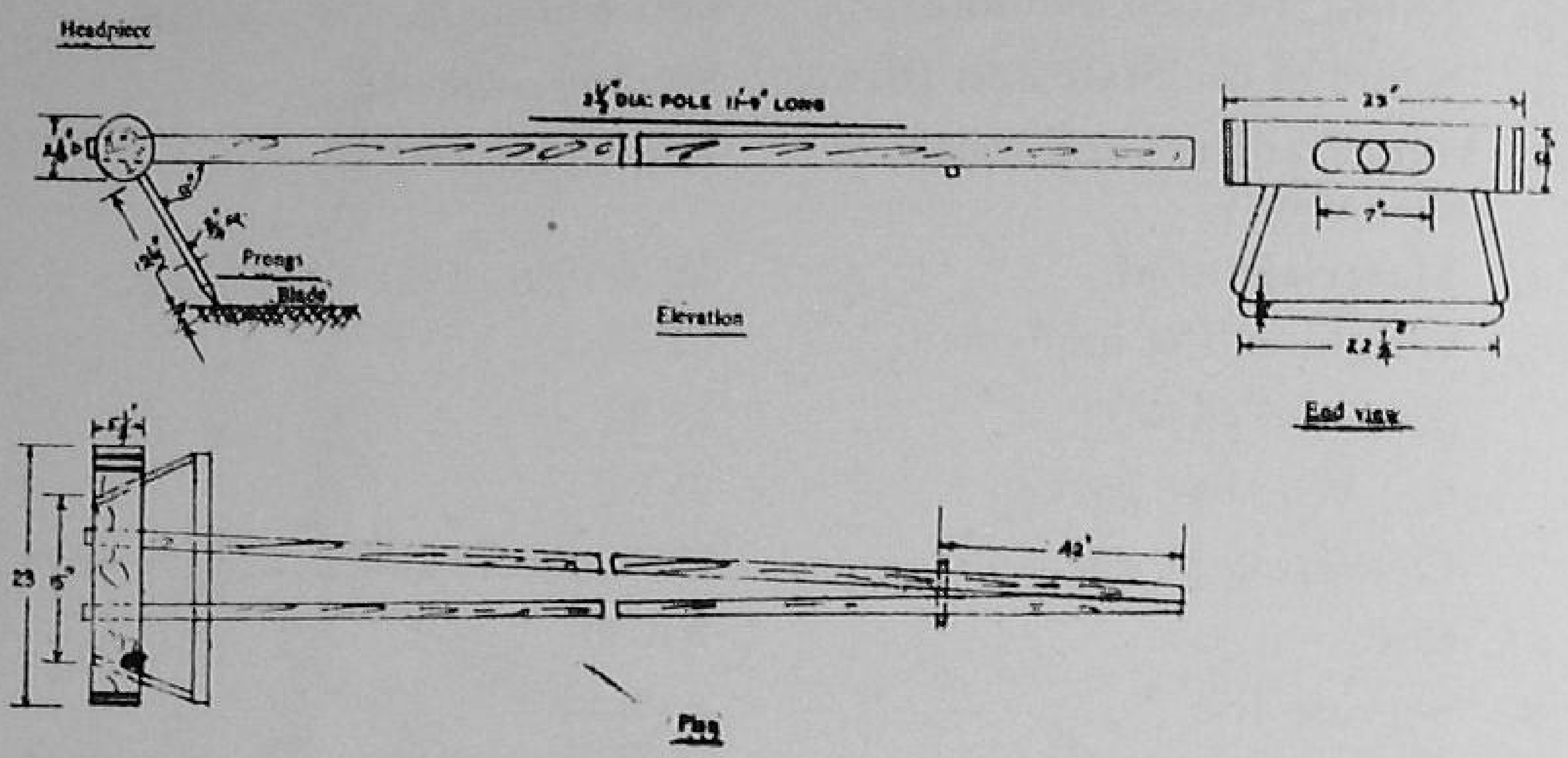
Blade Harrow (Amreli) Bombay

HARROWS

Entire Blade—Rapto (Bombay)

1.	Classification	Land preparation implement
2.	Name (English and local)	Entire blade harrow—Rapto
3.	Name of the State and District	Bombay—Amreli
4	Manufacturers and source of availability	Local artisans
5.	Materials used	Mild steel, Teak and Shisham wood
6.	Weight of the implement	64 lb.
	(i) Iron part	13 lb.
	(ii) Wooden part	51 lb.
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 20
9.	Service life	8 years
10.	Usage	For covering the seeds after sowing
11.	Method of application	The beam of the harrow is attached to the yoke by a rope and depth is adjusted by means of shifting the hitching point
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1.75
14.	Work rate	One acre per day
15.	Cost of operation per acre	Rs. 2.12
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	18 to 20 days
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
11.	Remarks	The average draft required is about 224 lb. The depth of penetration in black soils ranges from 1 to 2 inches

PLATE 42



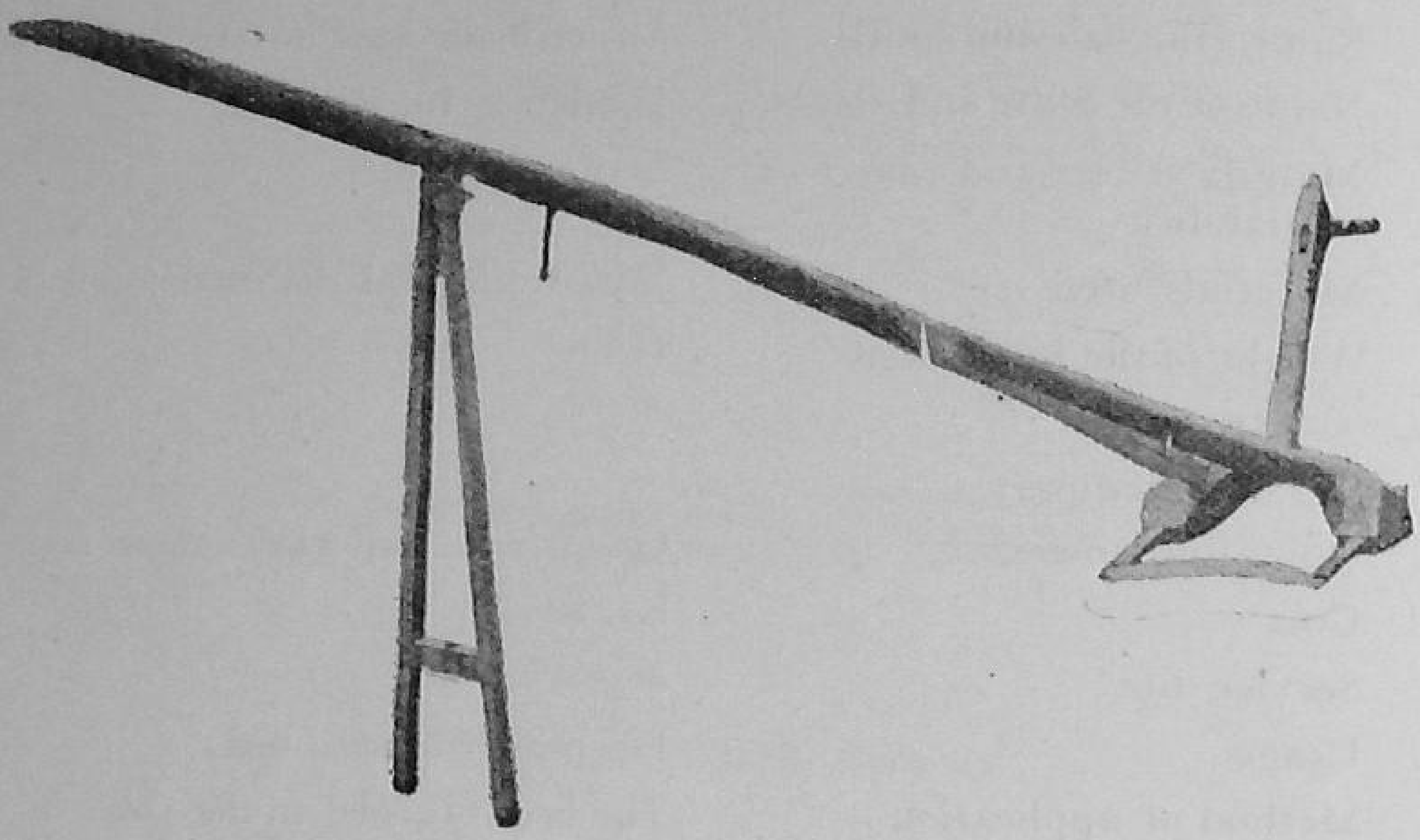
Blade Harrow (Amreli) Bombay

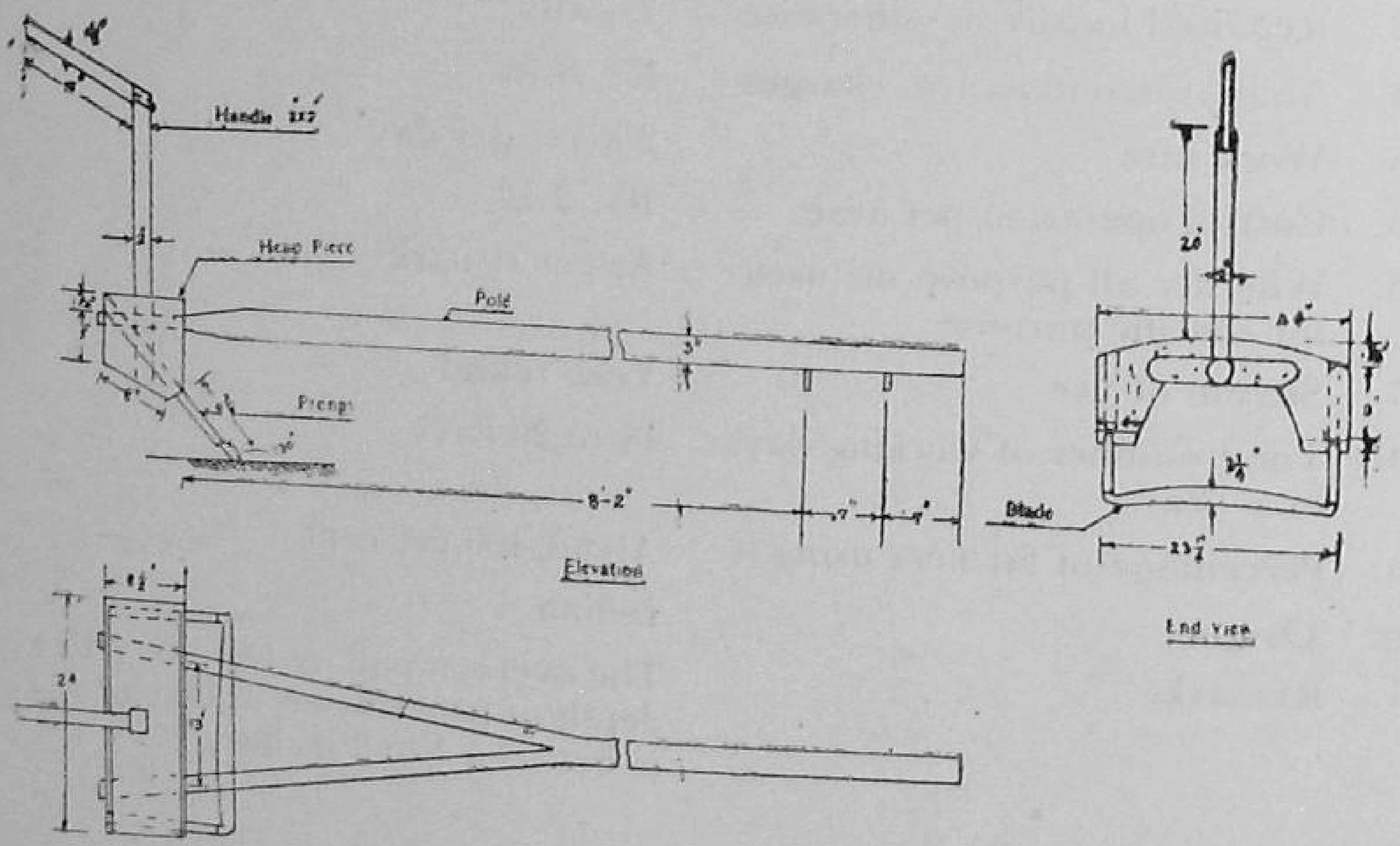
HARROWS

Entire blade harrow-Ekaliu (Bombay)

1.	Classification	Land preparation implement
2.	Name (English and local)	Entire blade harrow - Ekaliu
3.	Name of the State and District	Bombay - Amreli
4.	Manufacturers and source of availability	Lccal artisans
5.	Materials used	Mild steel, Teak and Shisham wood
6.	Weight of the implement	47 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 12/-
9.	Service life	5 years
10.	Usage	For preparing seed bed
11.	Method of application	The beam is tied to the yoke by a rope. A long bamboo stick attached with a scraper is used to clean the blade
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.75
14.	Work rate	2 acres per day
15.	Cost of operation per acre	Rs. 2.12
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17-	Season of use	Year round
11.	Total number of working days in a year	18 to 20 days
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	The average pull is 112 lb. The depth of penetration in black soils is between 1 to 2 inches.

PLATE 43





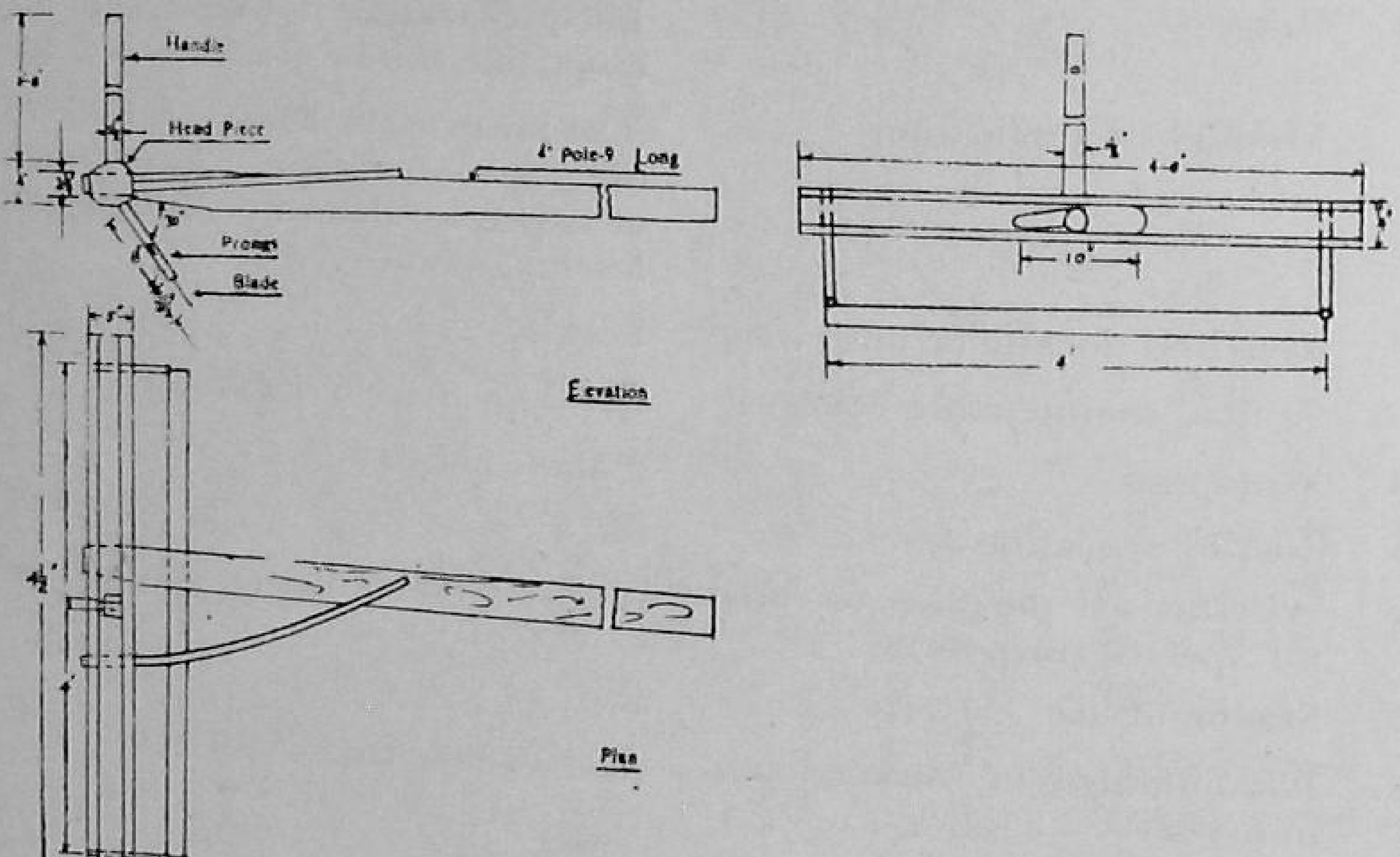
Blade Harrow (Broach) Bombay

HVRROWS

Entire Blade Harrow-Karale, Bakhar (Bombay)

1.	Classification	Land preparation implement
2.	Name (English and local)	Entire blade harrow - Karale, Bakhar
3.	Name of the State and District	Bombay - Broach
4.	Manufacturers and source of availability	By local artisans
5.	Materials used	Mild steel, Babul and Teak wood
6.	Weight of the implement	70 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 20
9.	Service life	5 years
10.	Usage	For preparation of seed bed for crops like cotton, *jowar* etc.
11.	Method of application	The beam of the harrow is tied to the yoke by a rope. Adjustment of depth is done by shifting the hitching point
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 2
14.	Work rate	2 acres per day
15.	Cost of operation per acre	Rs. 5
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	45 days in a year
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	The depth of penetration in black soil varies from 2 to 4 inches and the draft required to draw is about 200 lb. This type of harrow is also used in Aurangabad district of Hyderabad.

PLATE 44

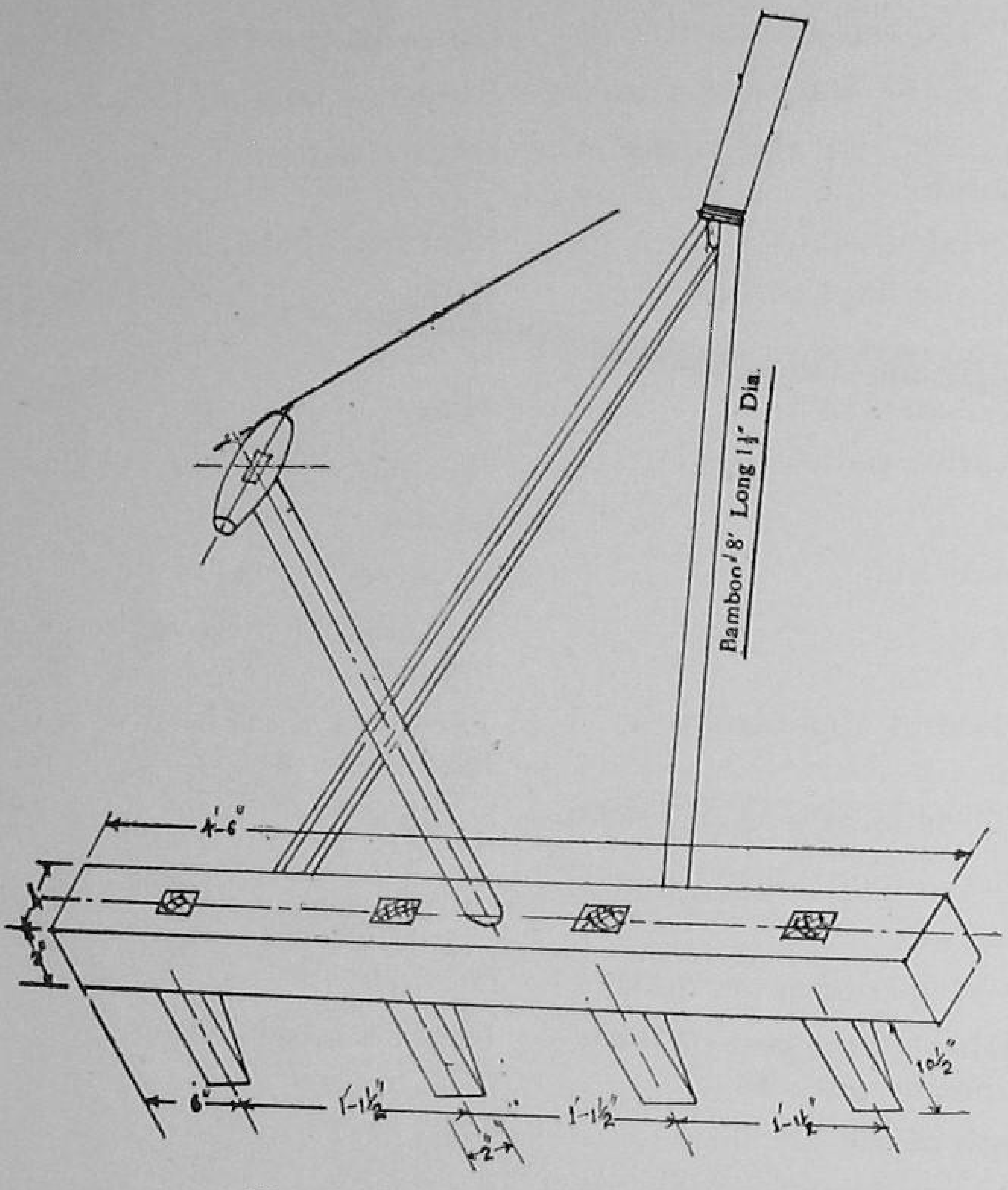


Blade Harrow (Jalgaon) Bombay

HARROWS

Entire Blade Harrow—Dhankya (Bombay)

1. Classification	Land preparation implement
2. Name (English and local)	Entire blade harrow—Dhankya
3. Name of the State and District	Bombay—Jalgaon, East Khandesh
4. Manufacturers and source of availability	Local artisans
5. Materials used	Mild steel, Babul and Teak wood
6. Weight of implement	75 lb.
(i) Iron part	11 lb.
(ii) Wooden part	64 lb.
7. Operating power	One pair of bullocks and one man
8. Cost	Rs. 30
9. Service life	10 years
10. Usage	It is used for covering seeds after sowing
11. Method of application	The beam of the harrow is tied to the yoke by a rope
12. Repaired locally or otherwise	Locally
13. Annual maintenance charges	—
14. Work rate	5 acres per day
15. Cost of operation per acre	Re. 0-75
16. Whether all purpose or used for specific purpose	Used for seed covering,
17. Season of use	—
18. Total number of working days in a year	6 days
19. Percentage of farmers using it	About 100 per cent
20. Origin	Indian
21. Remarks	The draft required to draw is about 56 lb. The depth of penetration in black soil (medium) is about one inch.

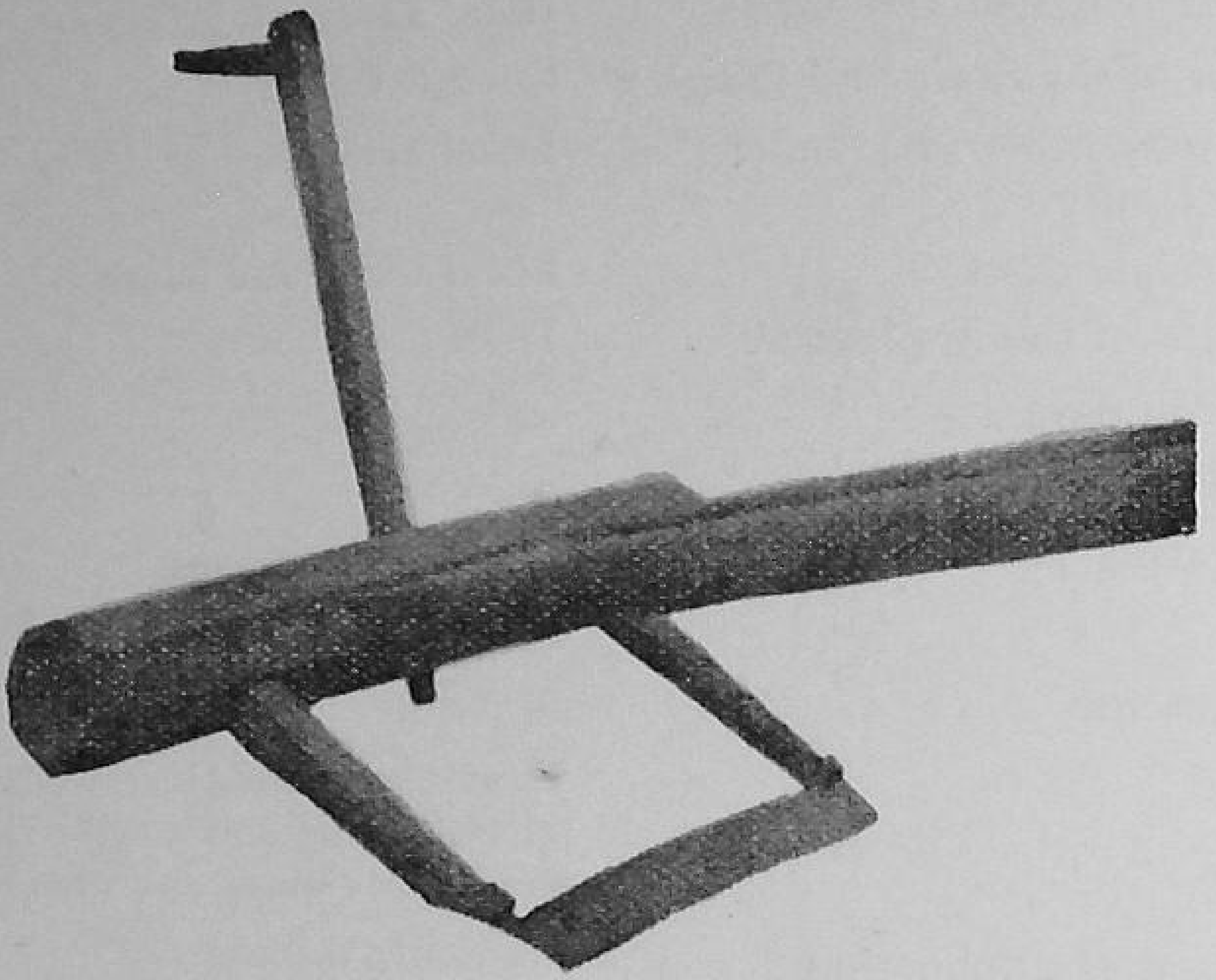


Hand Harrow (Coorg) Coorg

HARROWS

Hand Harrow—Halube (Coorg)

1.	Classification	Land preparation implement
2.	Name (English and local)	Hand harrow—Halube
3.	Name of the State and District	Coorg—Coorg
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Local wood and bamboo
6.	Weight of the implement	12 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One to two persons
8.	Cost	Rs. 1.50
9.	Service life	10 years
10.	Usage	Used for breaking clods, to pulverize the soil and to collect weeds previously uprooted
11.	Method of application	Manually worked A person pulls it by the beam
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.50
14.	Work rate	1 acre per day
15.	Cost of operation per acre	Rs. 1.50
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season for use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	The depth of penetration in sandy loam soil varies from 2 to 2.5 inches. This is also used for making cross furrows at a distance of 10 inches to 14 inches after making lengthwise furrows in order to sow seeds or to transplant seedlings at a point where the lengthwise and widthwise furrows cut.



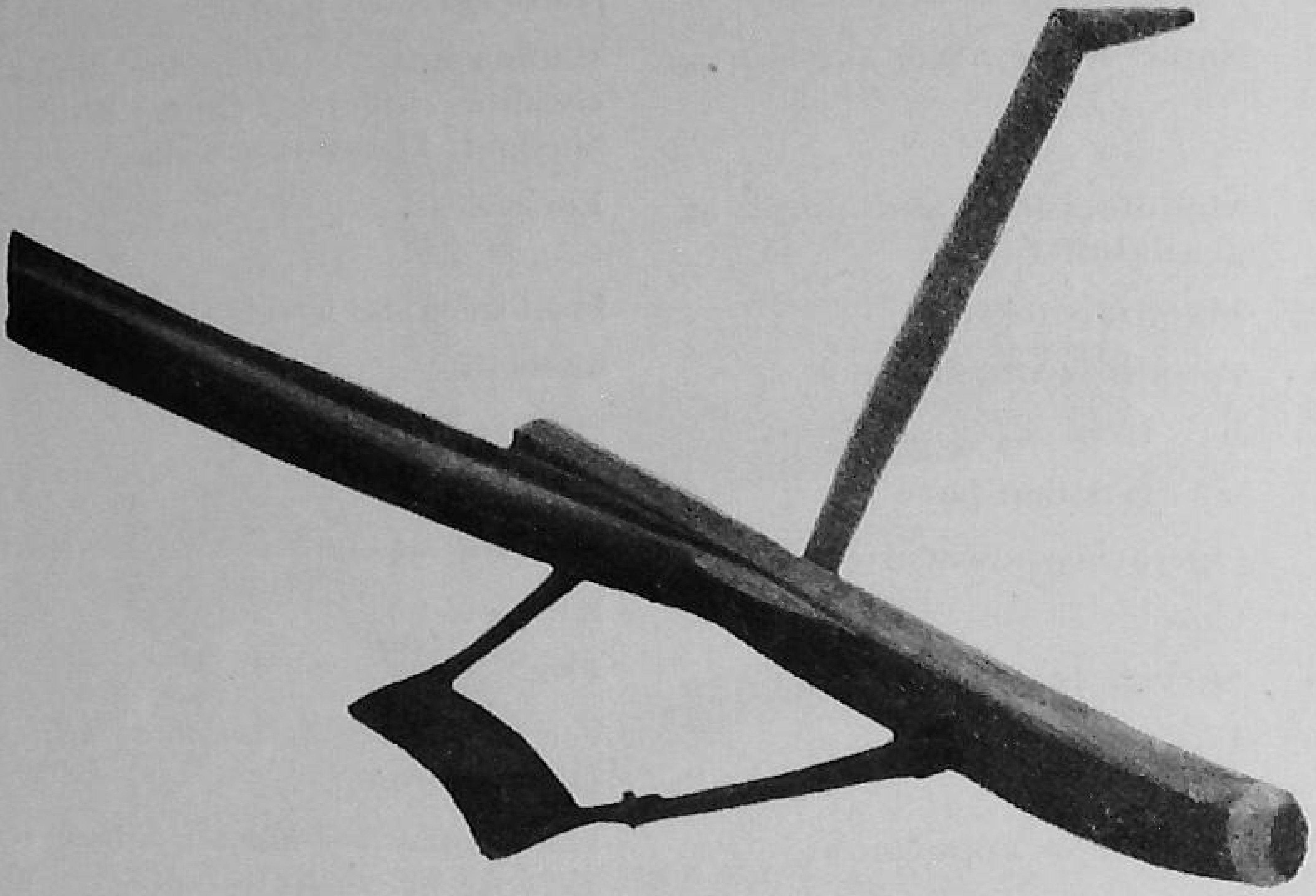
Blade Harrow (Khargone) Madhya Bharat

HARROWS

Blade Harrow—Bakhar (Madhya Bharat)

1.	Classification	Land preparation implement
2.	Name (English and local)	Blade harrow—Bakhar
3.	Name of the State and District	Madhya Bharat—Khargone, Bhind, Gwalior, Morena, Guna, Bhilsa, Sheopur, Mandsour, Nimar*
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Mild steel and wood
6.	Weight of the implement	62-88 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 15 to 22
9.	Service life	4 to 7 years
10.	Usage	For seed bed preparation of *kharif* and *rabi* crops
11.	Method of application	The beam of the Bakhar is tied to the yoke by means of ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 1.00
14.	Work rate	1-2 acres per day
15.	Cost of operation per acre	Rs. 2 to 3
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	The average draft in light black soil is about 190 lb. The depth of penetration varies from 2½ to 3 inches

*This type of harrow is also reported to be used in following tracts. : (1) Almost all over Hyderabad, Madhya Pradesh and Bombay State ; (2) Bellary District of Mysore State ; (3) Chingleput and North Arcot Districts of Madras ; (4) parts of Rajasthan State. The shape and size of Bakhar differs from place to place.

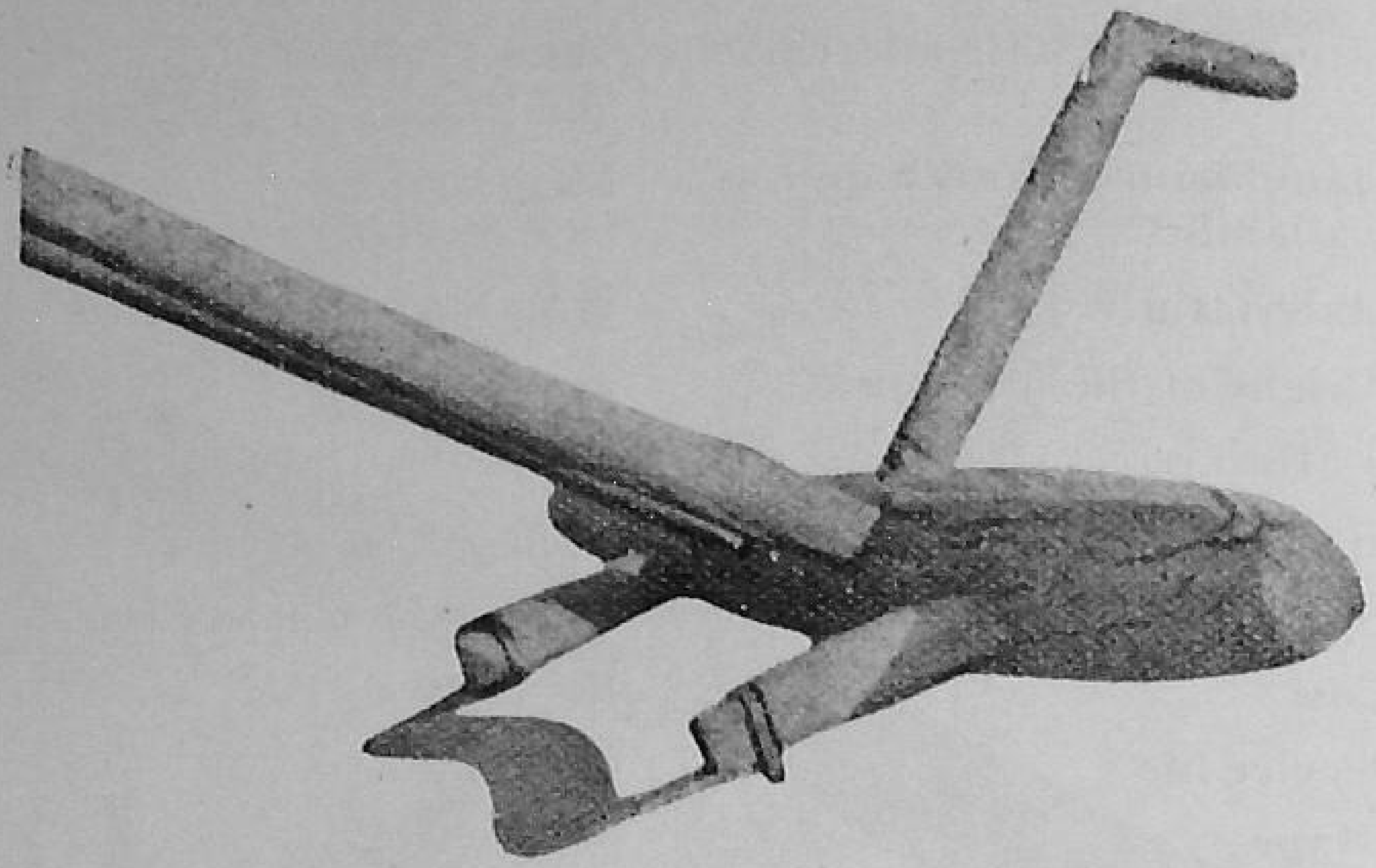


Blade Harrow (Guna) Madhya Pradesh

HARROWS

Blade Harrow—Bakhar (Madhya Bharat)

1.	Classification	Land preparation implement
2.	Name (English and local)	Blade harrow-Bakhar
3.	Name of the State and District	Madhya Bharat—Guna, Sheopur and Bhilsa
4.	Manufacturers and source of availability	Local artisans
5.	Material used	Mild steel and wood
6.	Weight of the implement	86 lb.
	(i) Iron part	26 lb.
	(ii) Wooden part	60 lb.
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 17.25
9.	Service life	3 years
10.	Usage	—
11.	Method of application	—
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance	Re. 1
14.	Work rate	2 acres per day
15.	Cost of operation per acre	Rs. 1.75
16.	Whether all purpose or used for specific purpose	For all general crops
17.	Season for use	Both *Rabi* and *kharif* season
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	The average draft in light black soil varies from 150 to 250 lb. The depth of penetration is $1\frac{1}{2}$ to 2 inches.



Blade Harrow (Mandsour) Madhya Bharat

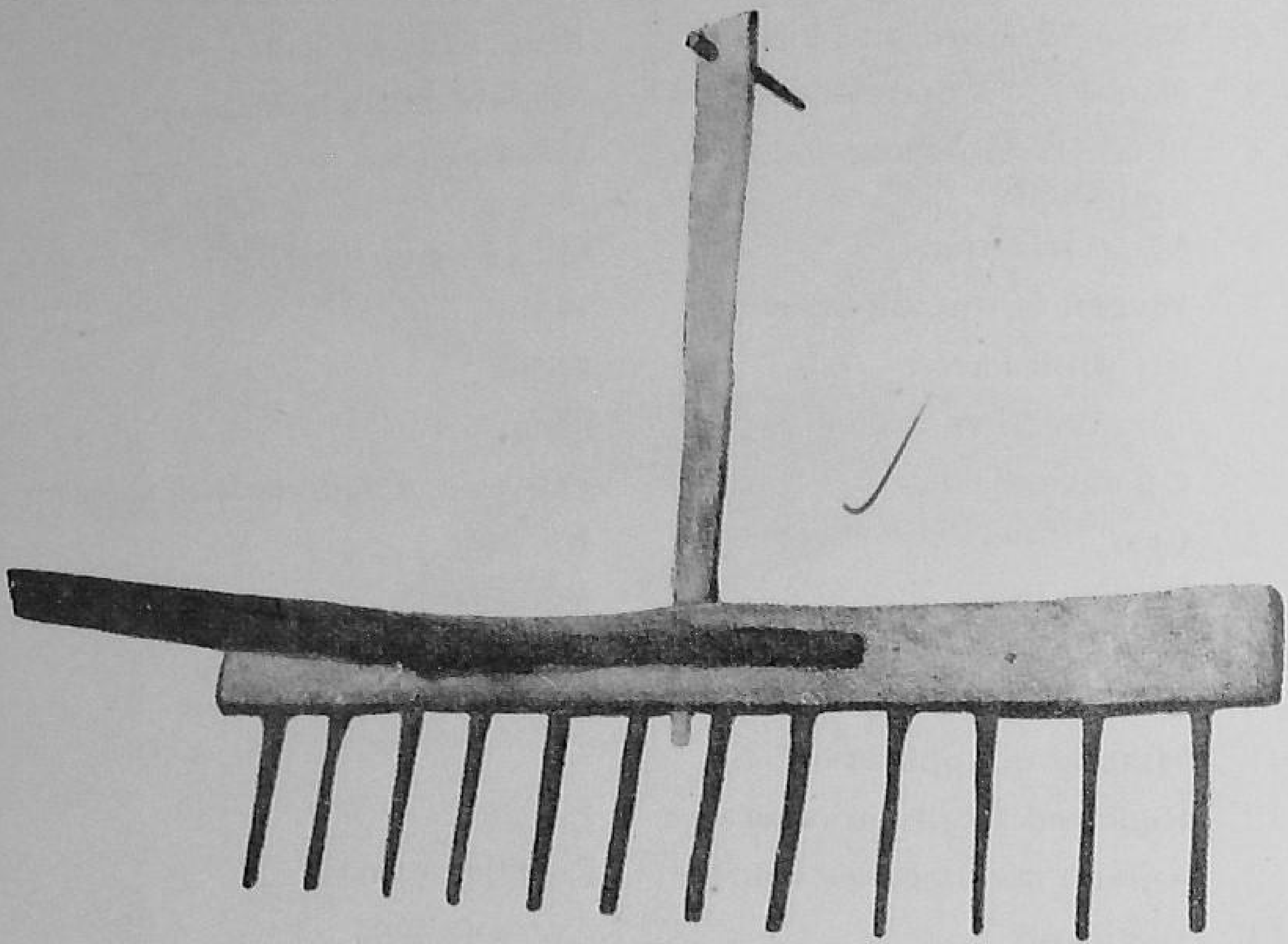
HARROWS

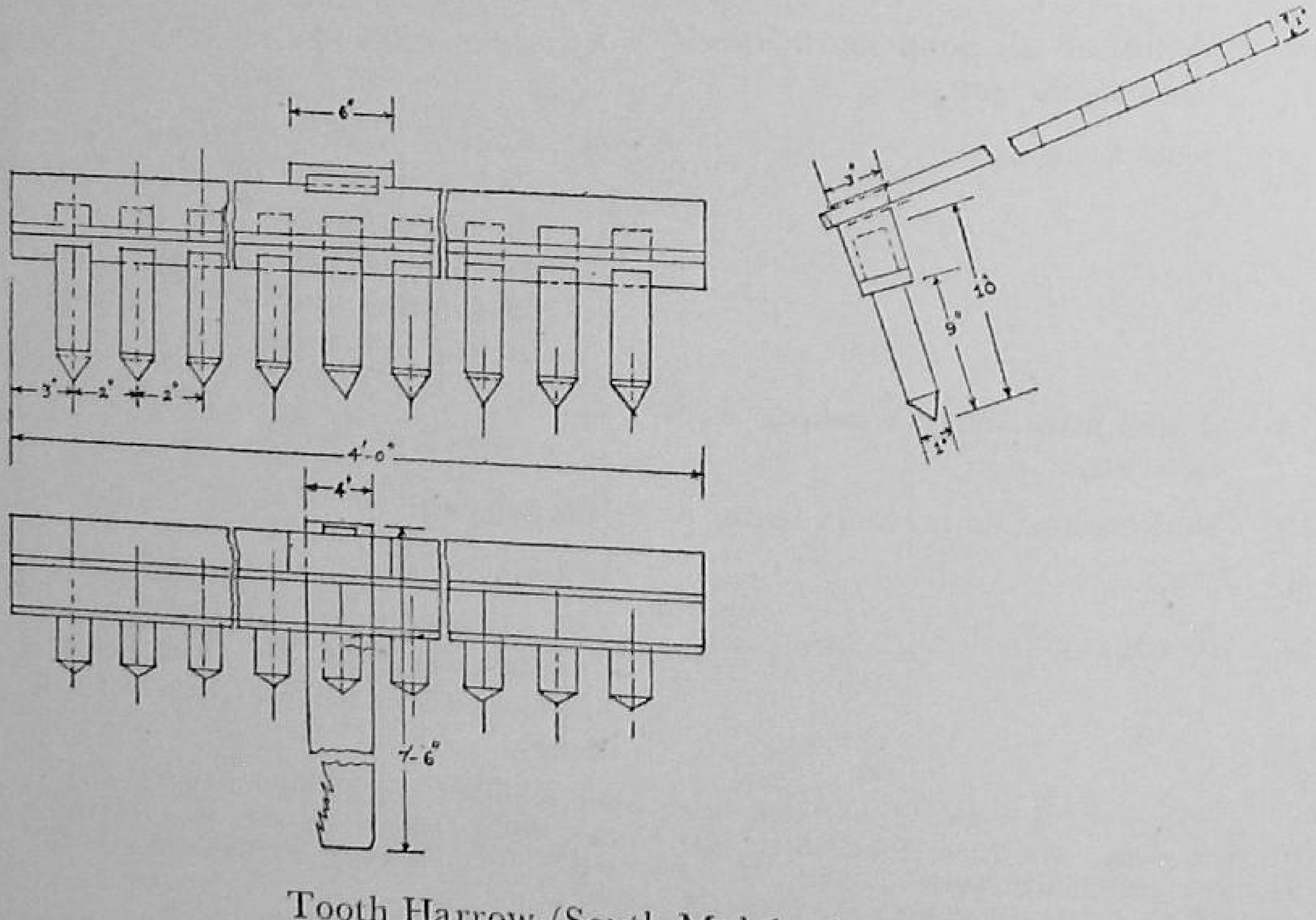
Blade Harrow—Bakhar (Madhya Bharat)

1.	Classification	Land preparation implement
2.	Name (English and local)	Blade harrow – Bakhar
3.	Name of the State and District	Madhya Bharat—Mandsour*
4	Manufacturers and source of availability	Local artisans
5.	Materials used	Mild steel and wood
6.	Weight of the implement	77 lb.
	(i) Iron Part	14 lb.
	(ii) Wooden part	63 lb.
7.	Operating power	One pair of bullocks with one man
8.	Cost	Rs. 18
9.	Service life	3-4 years
10.	Usage	For seed bed preparation of *jowar*, Cotton, wheat, gram, etc.
11.	Method of application	—
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1.50 to 2.50
14.	Work rate	1 acre per day
15.	Cost of operation per acre	Rs. 1.75 to 2.75
16.	Whether all purpose or used for specific purpose	As under item 17
17.	Season of use	(a) *Kkarif—jowar*, cotton, etc., twice before monsoon and during summer (b) *Rabi* – wheat, gram, etc., one in summer and 4 to 5 times during monsoon
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	The average draft in light black soils is about 130 lb. The depth of penetration varies from 1 to 3 inches

*Indentical types of harrows have been reported from the following areas : (1) Akola of Madhya Pradesh ; (2) Nimar and Melura Zone of Madhya Bharat : (3) Chitorgarh district of Rajasthan ; (4) Raichur, Adilabad, Osmanabad of Hyderabad State ; (5) Bombay State.

PLATE 49



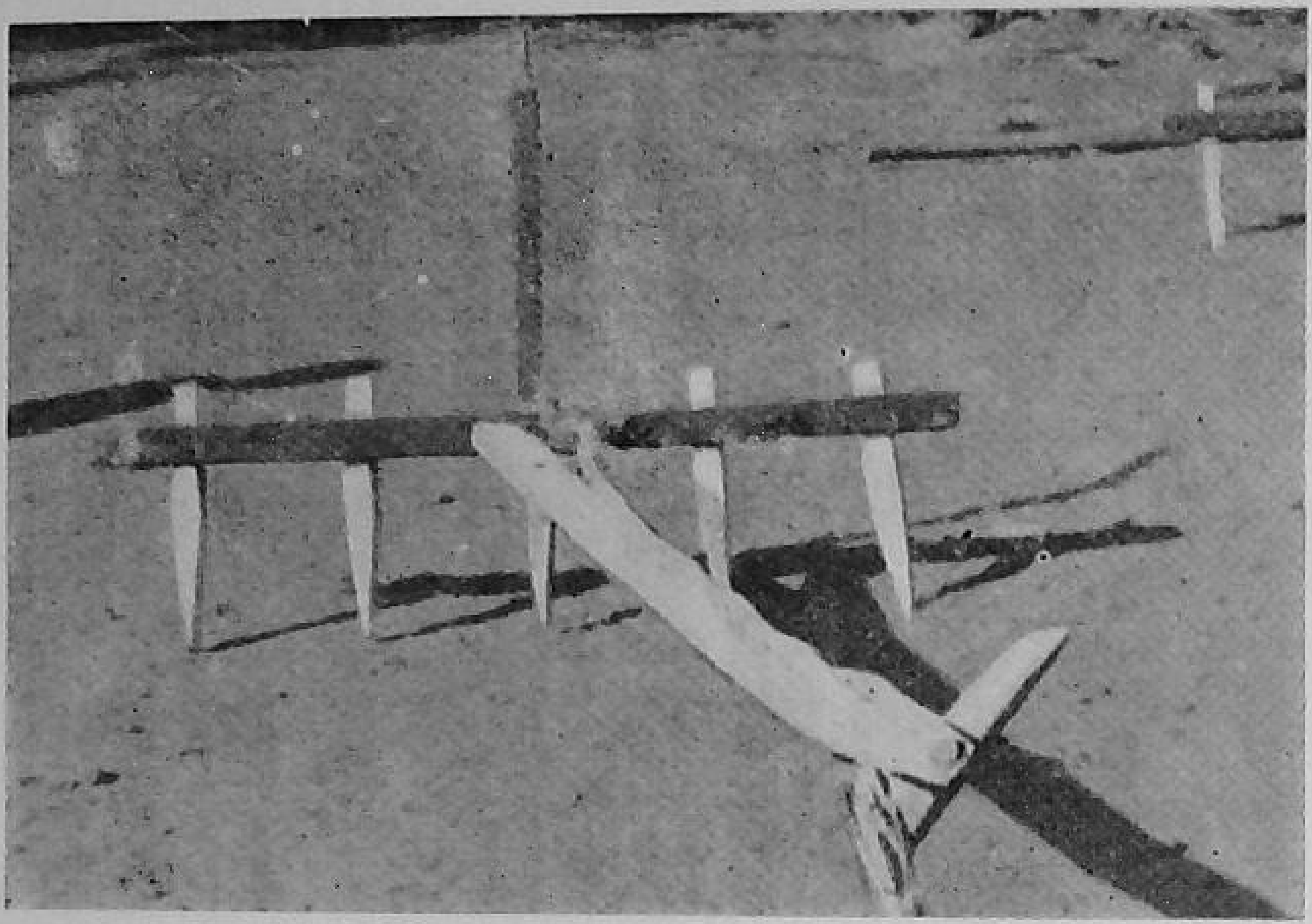


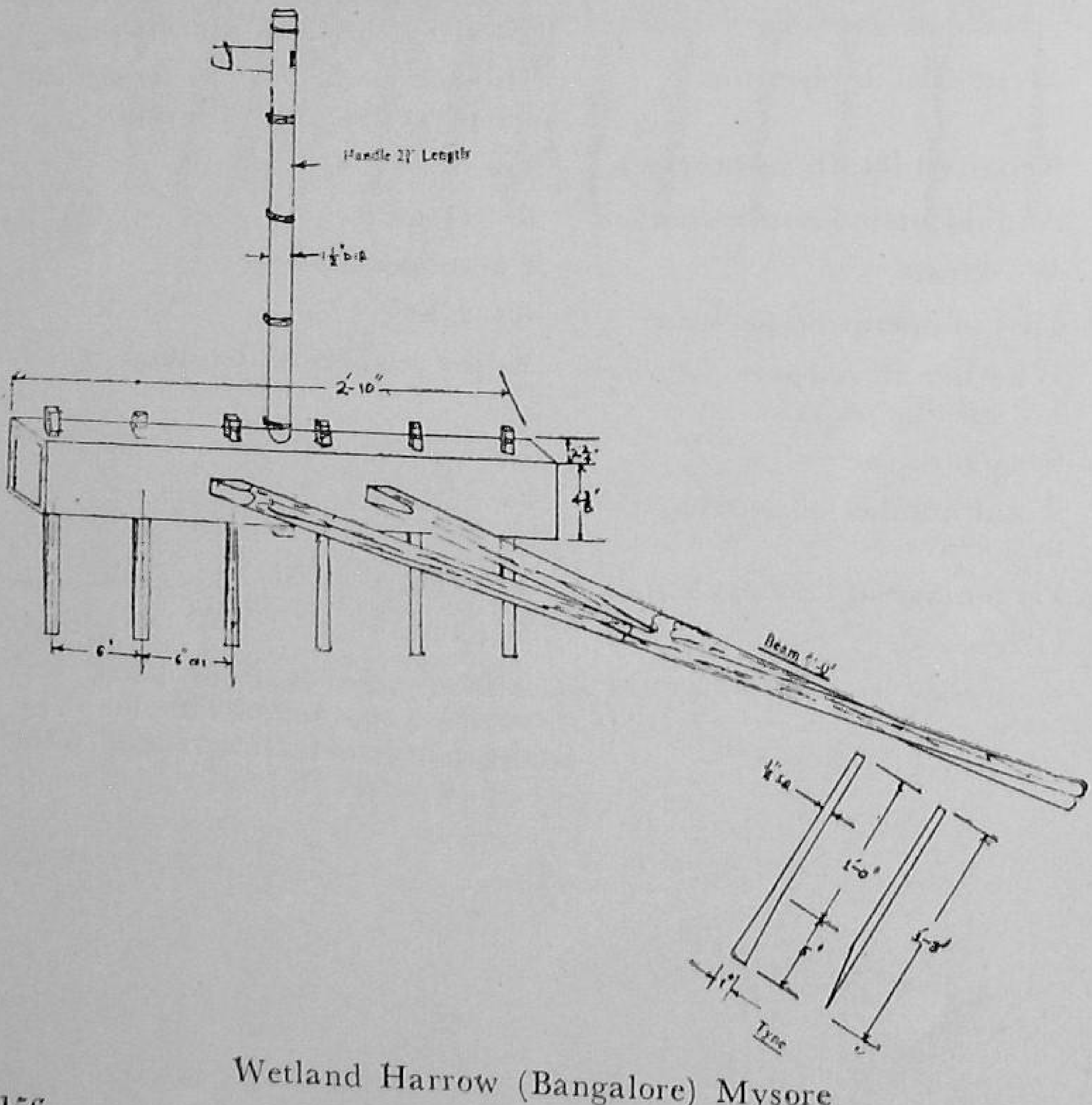
Tooth Harrow (South Malabar) Madras

HARROWS

Tooth Harrow—Varandi (Madras State)

1.	Classification	Land preparation implement
2.	Name (English and local)	Tooth harrow—Varandi
3.	Name of the State and District	Madras State—South Malabar
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Wood
6.	Weight of the implement	25 lb.
	(i) Iron part	—
	(ii) Wooden part	25 lb.
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 8
9.	Service life	6 year
10.	Usage	Used in drylands for preparation of seed-beds for dry paddy and covering the seeds after sowing
11.	Method of application	Hitched to the yoke by tying the beam to the yoke with ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1½ to 2
14.	Work rate	2 acres per day
15.	Cost of operation per acre	Rs. 2.50
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	50 to 60 per cent
20.	Origin	Indian
21.	Remarks	The average draft in black soil varies from 90 to 120 lb. The depth of penetration varies from 4 to 6 inches





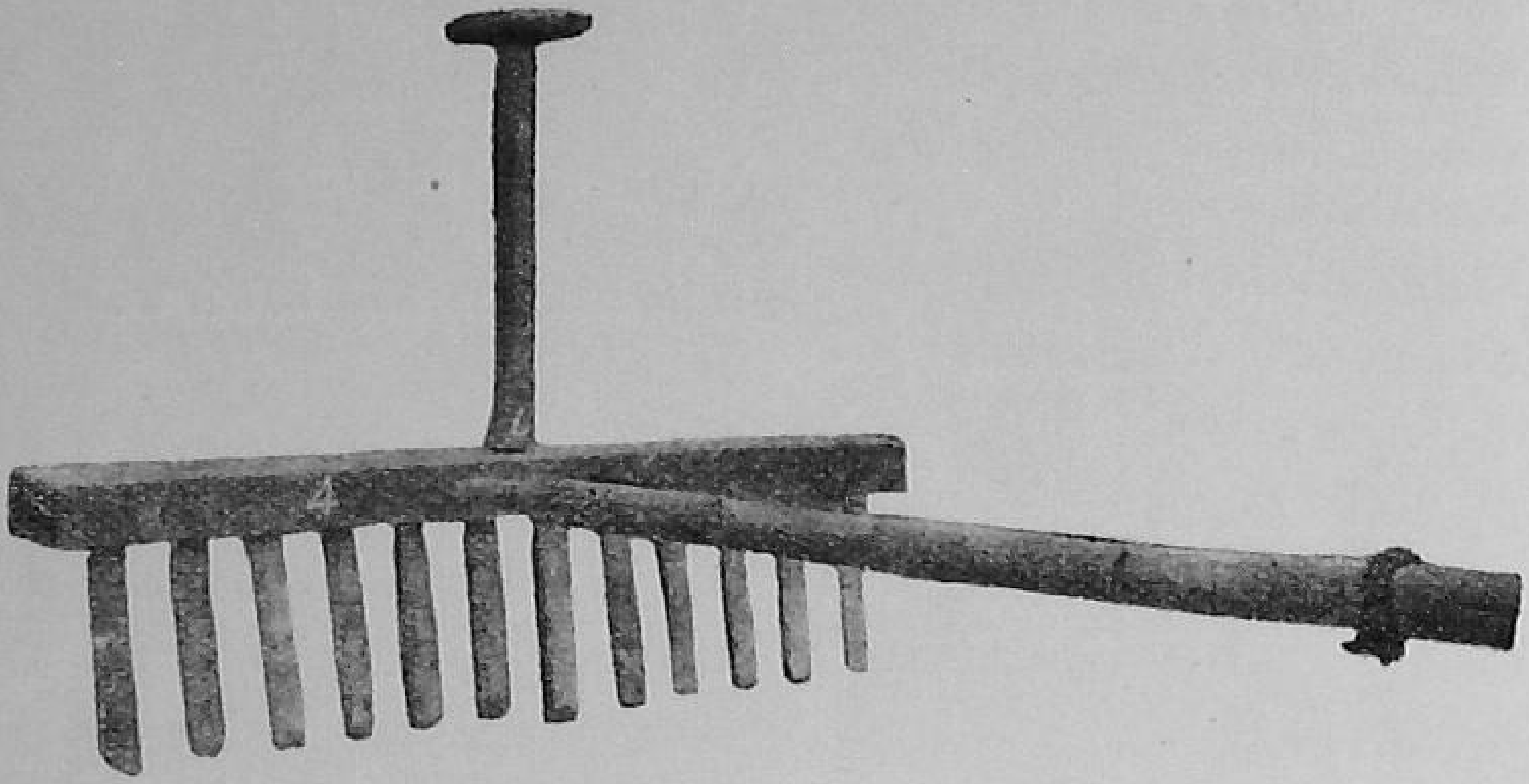
Wetland Harrow (Bangalore) Mysore

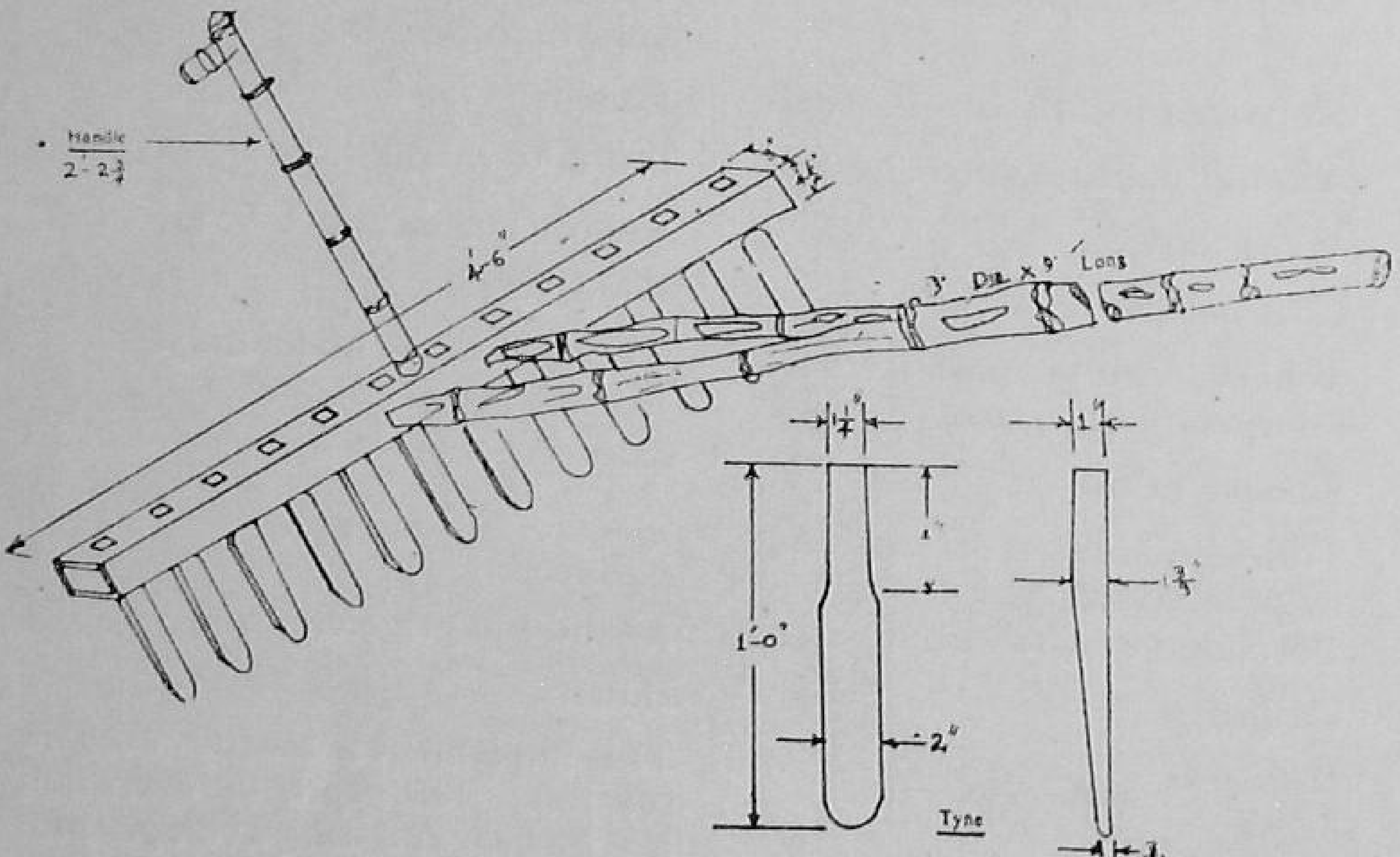
HARROWS

Wetland Harrow – Halube (Mysore)

1.	Classification	Land preparation implement
2.	Name (English and local)	Wetland harrow—Halube
3	Name of the State and District	Mysore—Bangalore
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Iron, bamboo, and Babul wood
6.	Weight of the implement	30 lb.
	(i) Iron part	20 lb.
	(ii) Wooden part	10 lb.
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 15
9.	Service life	—
10.	Usage	For preparation of seed bed
11.	Method of application	The implement is hitched to the yoke by ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.75 to 1.00
14.	Work rate	4 acres per day
15.	Cost of operation per acre	Rs. 3 to 4
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	This implement is mostly used in red soil. The depth of operation is 6 inches and the average pull is 135 lb. There are six iron tines in this implement.

PLATE 51





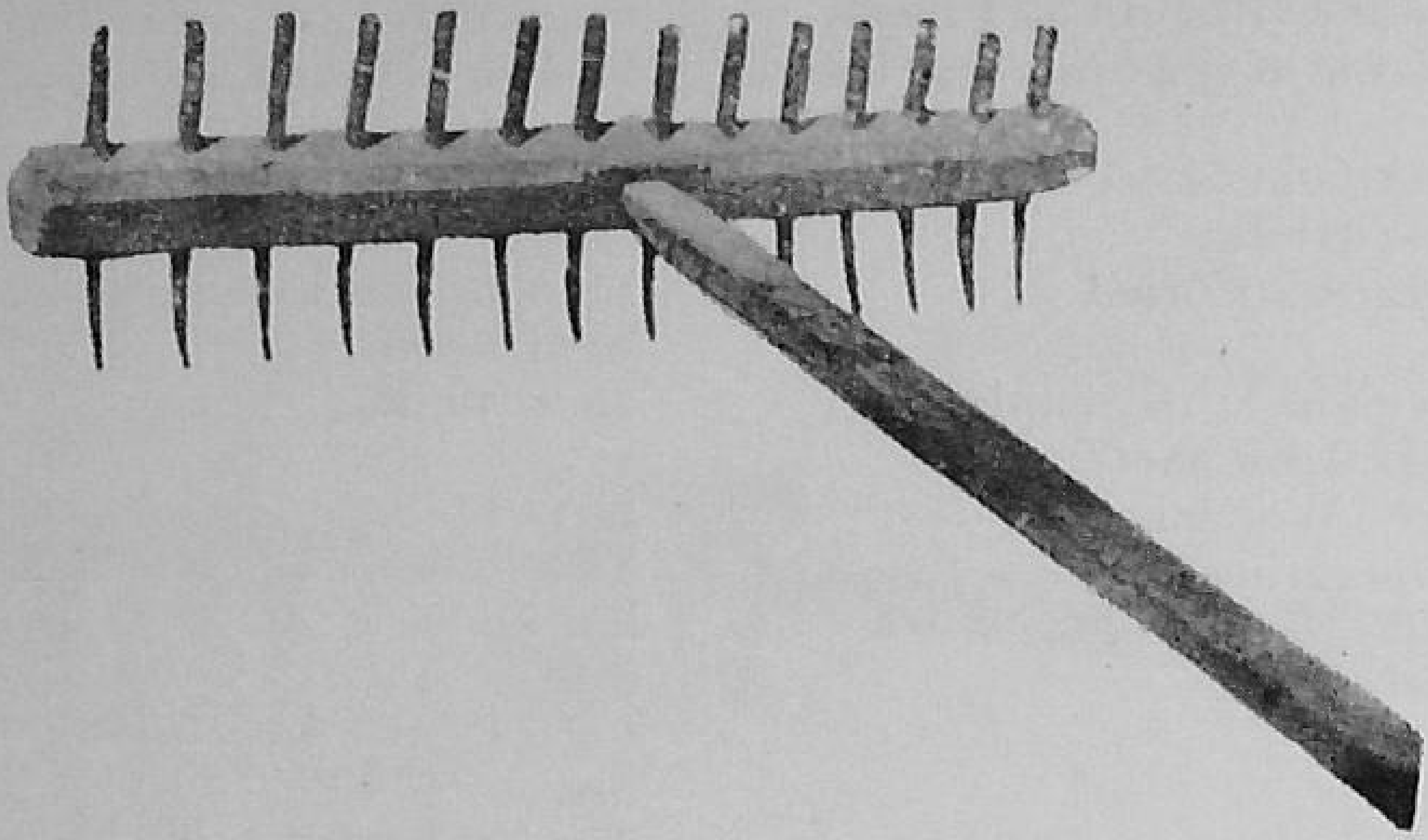
Harrow (Hassan) Mysore

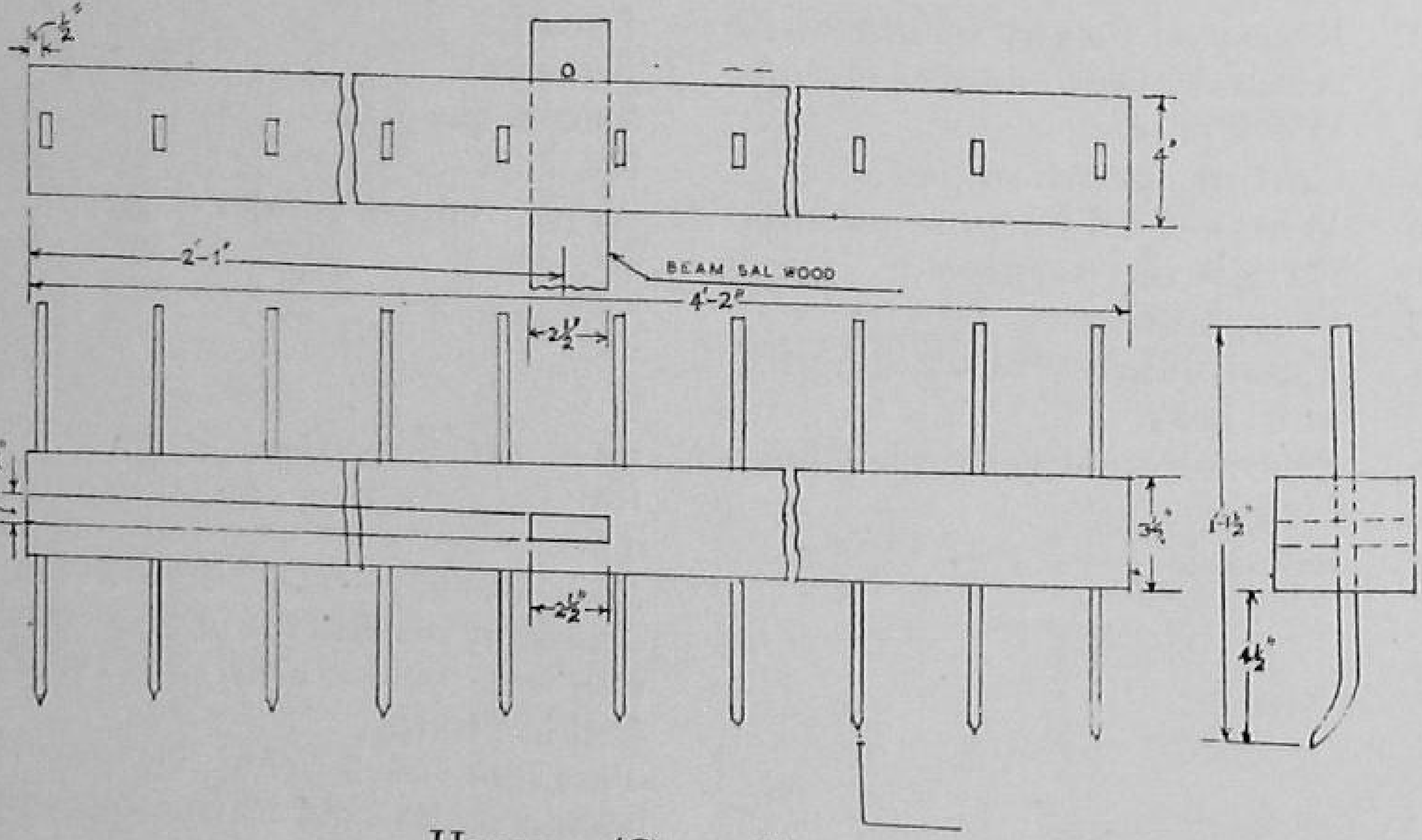
HARROWS

Country Harrow—Halube (Mysore)

1.	Classification	Land preparation implement
2.	Name (English and local)	Country harrow—Halube
3.	Name of the State and District	Mysore—Hassan, Bangalore, Tumkur, Mandya
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Mango, jackwood, bamboo and hard wood
6.	Weight of the implement	25 to 40 lb.
	(i) Iron part	—
	(ii) Wooden part	25 to 40 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 6
9.	Service life	—
10.	Usage	Used for the preparation of seed bed
11.	Method of application	The implement is hitched to the yoke by ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	3 acres per day
15.	Cost of operation per acre	Rs. 1.50
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	90 per cent
20.	Origin	Indian
21.	Remarks	This implement is used on red and laterite soils. The average depth, of penetrates in one operation is 2 inches and the average pull is 140 lb. This type of harrow is also reported to be used in the following areas. (I) Gulbarga, Raichur, Medak, Hyderabad Districts of Hyderabad State (2) Ferozepur District of Punjab (3) Jabalpur, Balaghat Districts of Madhya Pradesh (4) West Godavari, Srikakulam Districts of Andhra Pradesh (5) Coorg State

PLATE 52



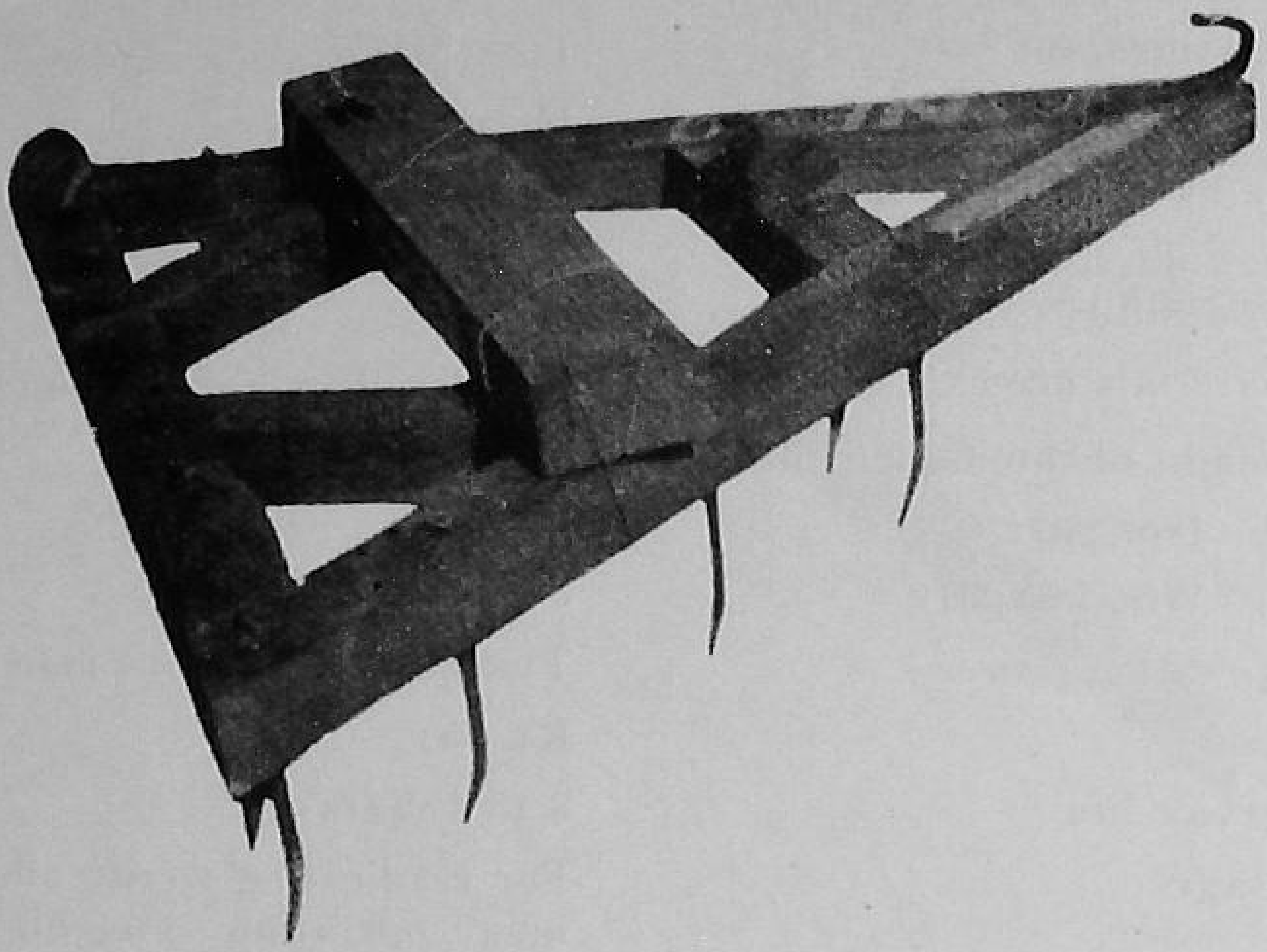


Harrow (Cuttack) Orissa

HARROWS

Harrow—Bida (Orissa)

1.	Classification	Land preparation implement
2.	Name (English and local)	Harrow—Bida
3.	Name of the State and District	Orissa—Cuttack
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Sal, Bandhan wood and mild steel
6.	Weight of the implement	46 lb.
	(i) Iron part	8 lb.
	(ii) Wooden part	38 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 15
9.	Service life	3 to 4 years
10.	Usage	For eradicating weeds and thinning operation for high land paddy and jute
11.	Method of application	Hitched to the yoke and beam, by ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1.50
14.	Work rate	2 acres per day
15.	Cost of operation per acre	About Rs. 1.50 to 2
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 90 per cent
20.	Origin	Indian
21.	Remarks	The average draft is 130 lb. The depth of working is about 1 to 2 inches. These types have riding attachments and are used for seed bed preparation

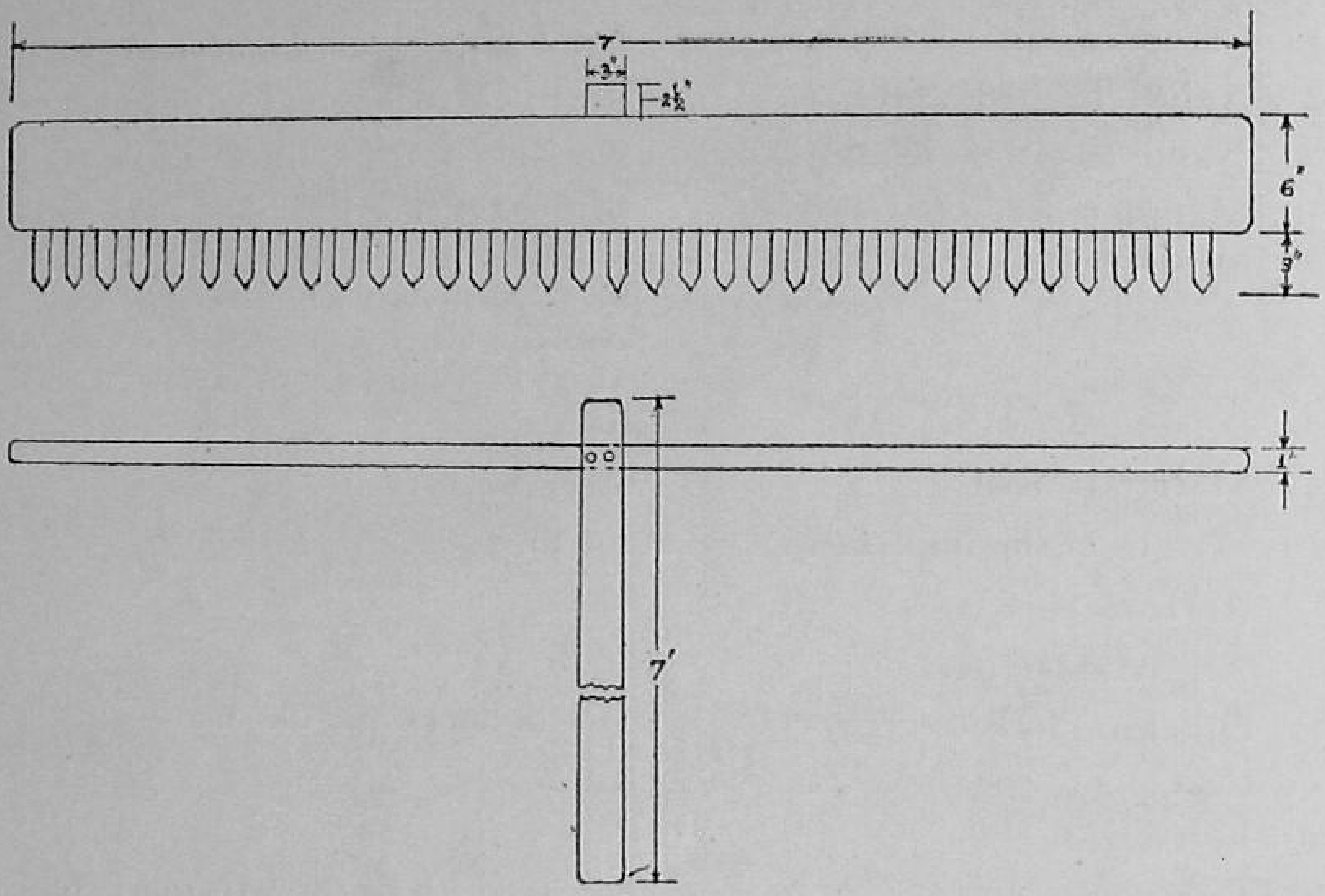


Harrow—Punjab

HARROWS

Harrow (Punjab)

1.	Classification	Land preparation implement
2.	Name (English and local)	Harrow - (triangular with spikes)
3.	Name of the State and District	Punjab—throughout the State
4.	Manufacturers and source of availability	M/s. Mukand Lal Subzi Mandi Karnal M/s. National Engineering Co., Ambala City M/s. Parkash Engineering Co., Batala
5.	Materials used	Steel, Shisham wood
6.	Weight of the implement	105 lb.
	(i) Iron part	73 lb.
	(ii) Wooden part	32 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 25
9.	Service life	6—8 years
10.	Usage	For seed bed preparation for wheat, maize and cotton. It is useful for breaking soil crust. It is also used for weeding and hoeing in wheat.
11.	Method of application	A pair of bullocks in yoke is hitched to the harrow with a long chain.
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 2 to 4
14.	Work rate	6 acres per day
15.	Cost of operation per acre	Re. 1.00 per acre
16.	Whether all purpose or used for specific purpose	For crops like cotton, maize and wheat
17.	Season for use	Used once for cotton and maize and thrice for wheat
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	5 per cent
20.	Origin	Indian (by the Punjab Agricultural Department)
21.	Remarks	The depth of penetration in alluvial (heavy loam) soil varies from 1.5—2 inches. The draft required is about 168 lb. The number of tines are 17.

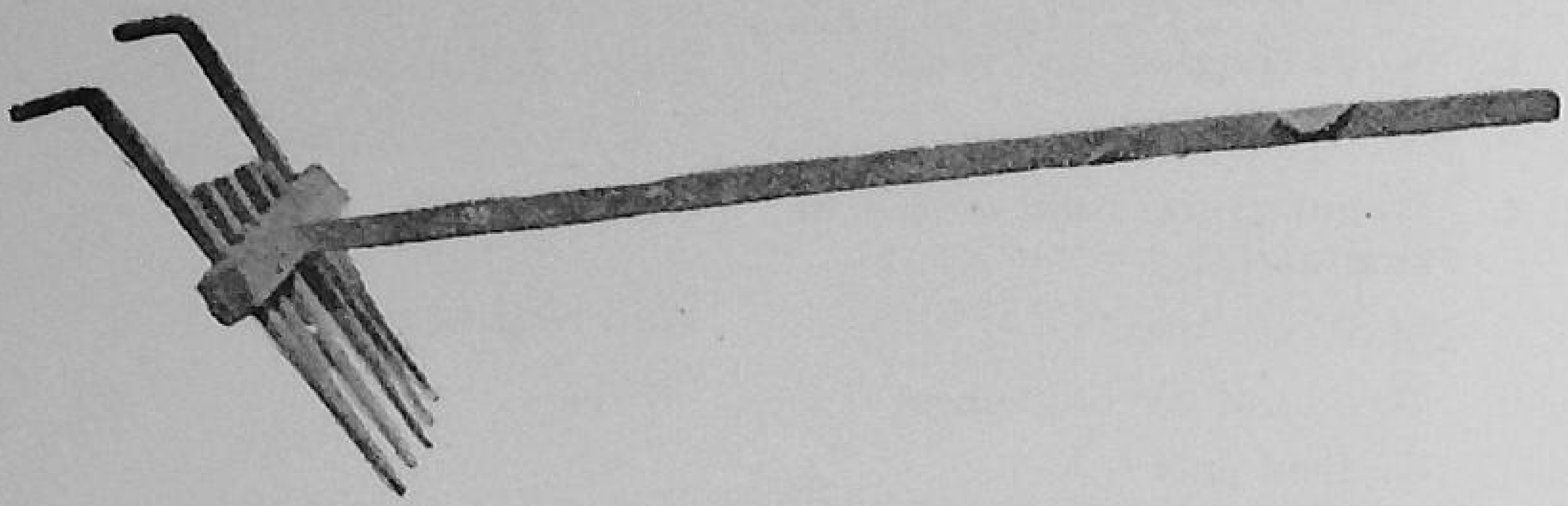


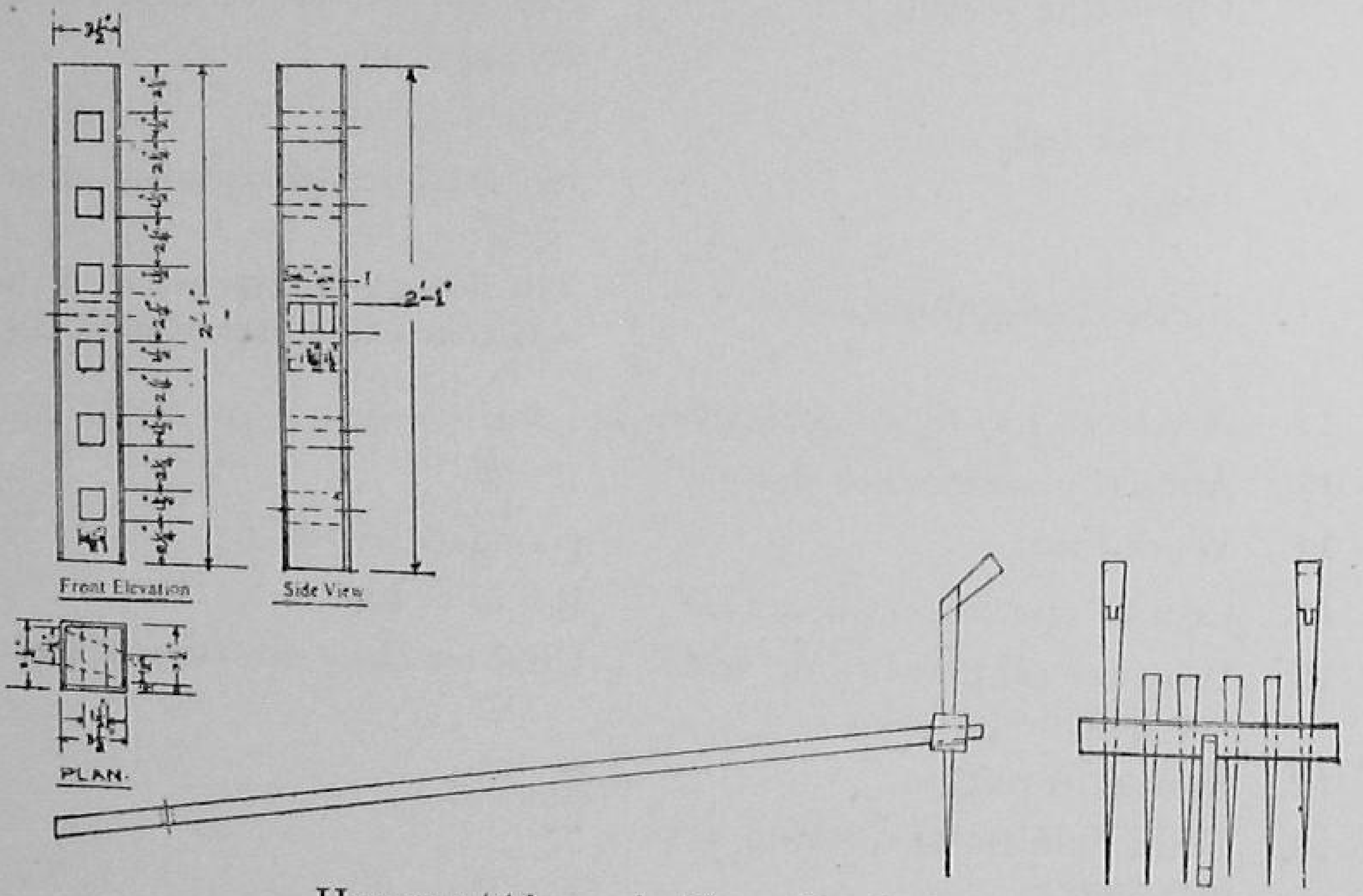
Spike Tooth Harrow (Quilon) Travancore-Cochin

HARROWS

Spike Tooth Harrow—Palli (Travancore-Cochin)

1.	Classification	Land preparation implement
2.	Name (English and local)	Spike tooth harrow—Palli
3.	Name of the State and District	Travancore-Cochin—Quilon
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Mild steel and wood
6.	Weight of the implement	75—85 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 35 to 43
9.	Service life	4 to 5 years
10.	Usage	For seed bed preparation of paddy crops
11.	Method of application	The harrow is attached to a beam and yoked to a pair of bullocks
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 2
14.	Work rate	½ an acre per day
15.	Cost of operation per acre	Rs. 10 to 12
16	Whether all purpose or used for specific purpose	Used for the cultivation of paddy
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	95 per cent
20.	Origin	Indian
21.	Remarks	This implement is used only when the leveller is not used. The average draft in sandy soil under ploughed conditions is about 60-80 lb. The depth of penetration varies from 2-3 inches.



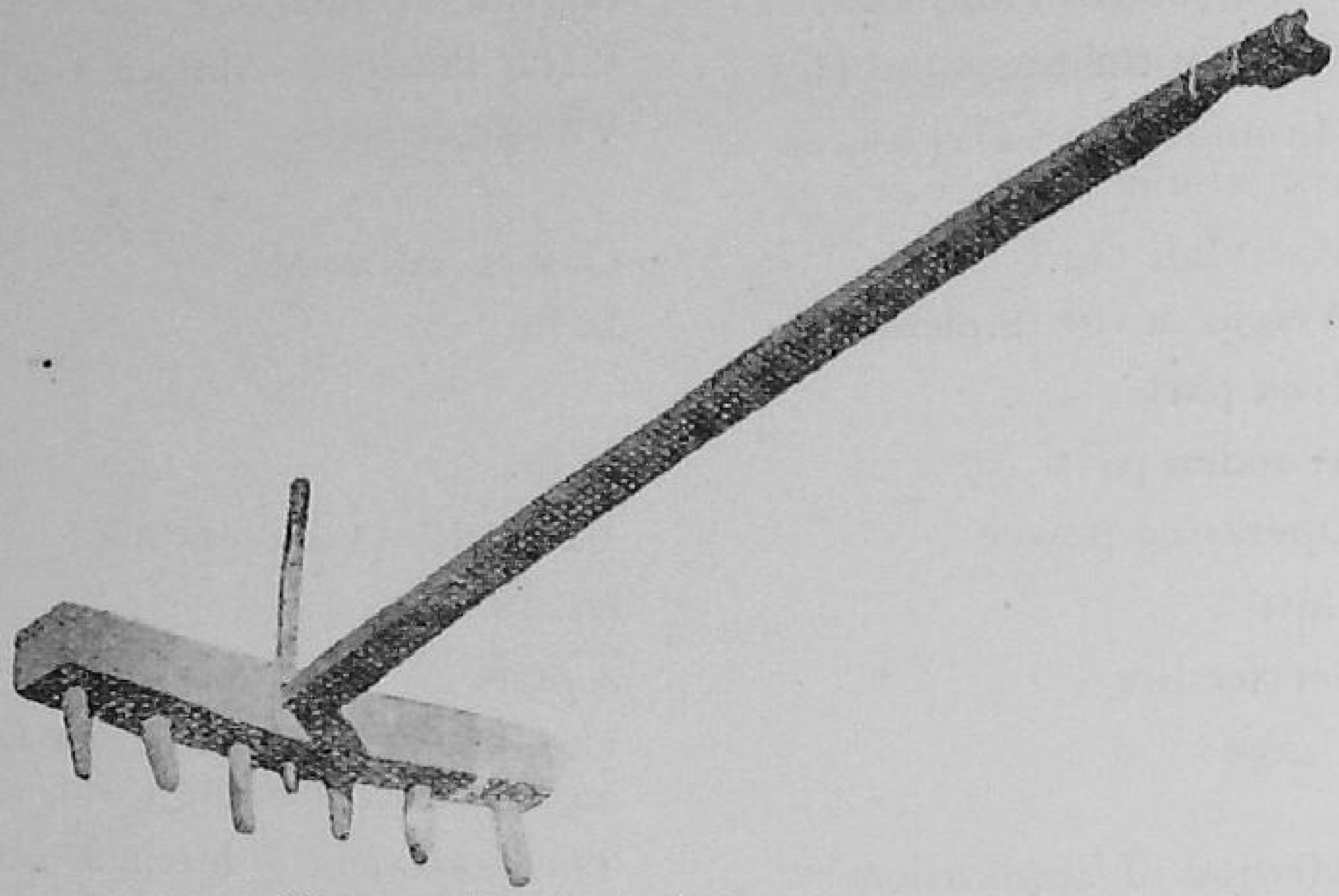


Harrow (Almora) Uttar Pradesh

HARROWS

Harrow—Damala (Uttar Pradesh)

1.	Classification	Land preparation implement
2.	Name (English and local)	Harrow—Damala
3.	Name of the State and District	Uttar Pradesh—Almora, Garhwal
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Oak or Sal wood
6.	Weight of the implement	16 lb.
	Iron part	—
	Wooden part	16 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 10
9.	Service life	8 years
10.	Usage	Used for breaking crust, for weeding and for collecting weeds
11.	Method of application	The implement is hitched behind a pair of bullocks
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1.50
14.	Work rate	$\frac{1}{2}$ to 1 acre per day
15.	Cost of operation per acre	Rs. 7
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	This implement is used in alluvial and loam soils. The average depth of penetration is 2 inches to 3 inches and the pull is about 120 lb.

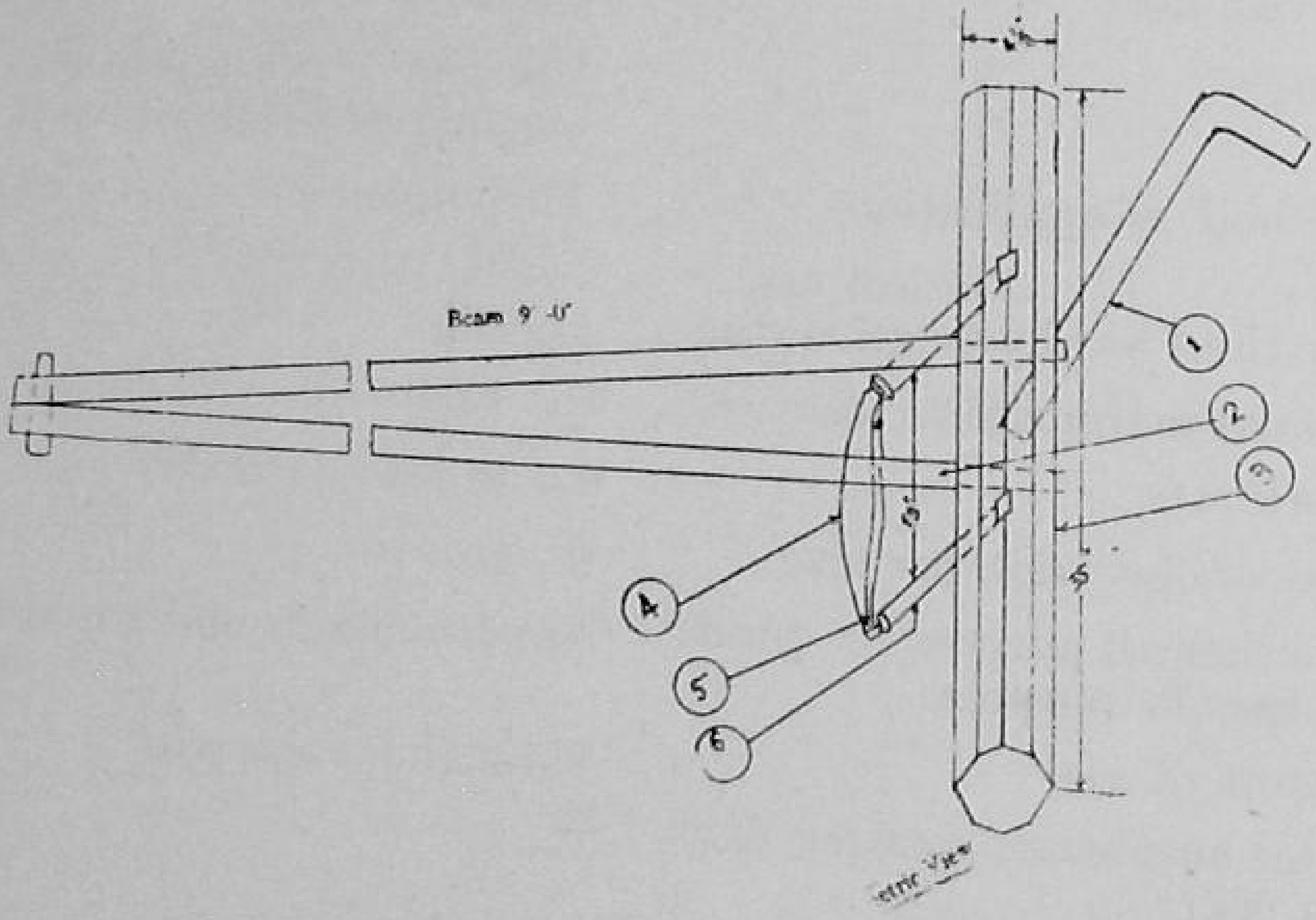


Harrow (Garhwal) Uttar Pradesh

HARROWS

Harrow—Danyal (Uttar Pradesh)

1.	Classification	Land preparation implement
2.	Name (English and local)	Harrow—Danyal
3.	Name of the State and District	Uttar Pradesh—Tehri Garhwal, Garhwal
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Wood
6.	Weight of the implement	20 lb.
	(i) Iron part	—
	(ii) Wooden part	20 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 10
9.	Service life	8 to 10 years
10.	Usage	Used for breaking crusts, for weeding and collection of weeds
11.	Method of application	The implement is hitched behind a pair of bullocks
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 1.00
14.	Work rate	0.5 to 1 acre per day
15.	Cost of operation per acre	Rs. 8 to 10
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Throughout the year
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	The implement is used in alluvial soil. The average depth of operation is 2 to 3 inches and the pull is about 118 lb.



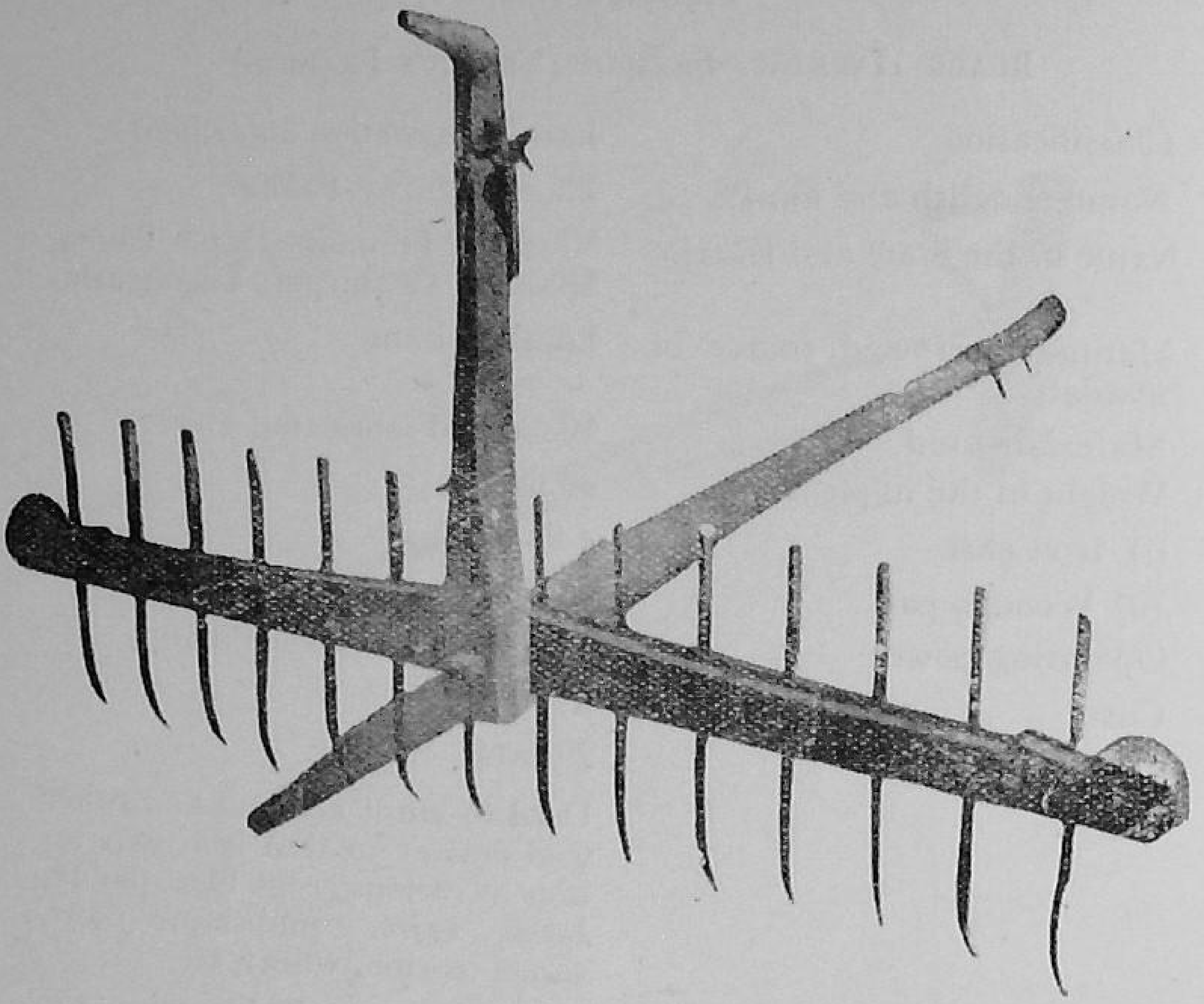
Blade Harrow (Datia) Vindhya Pradesh

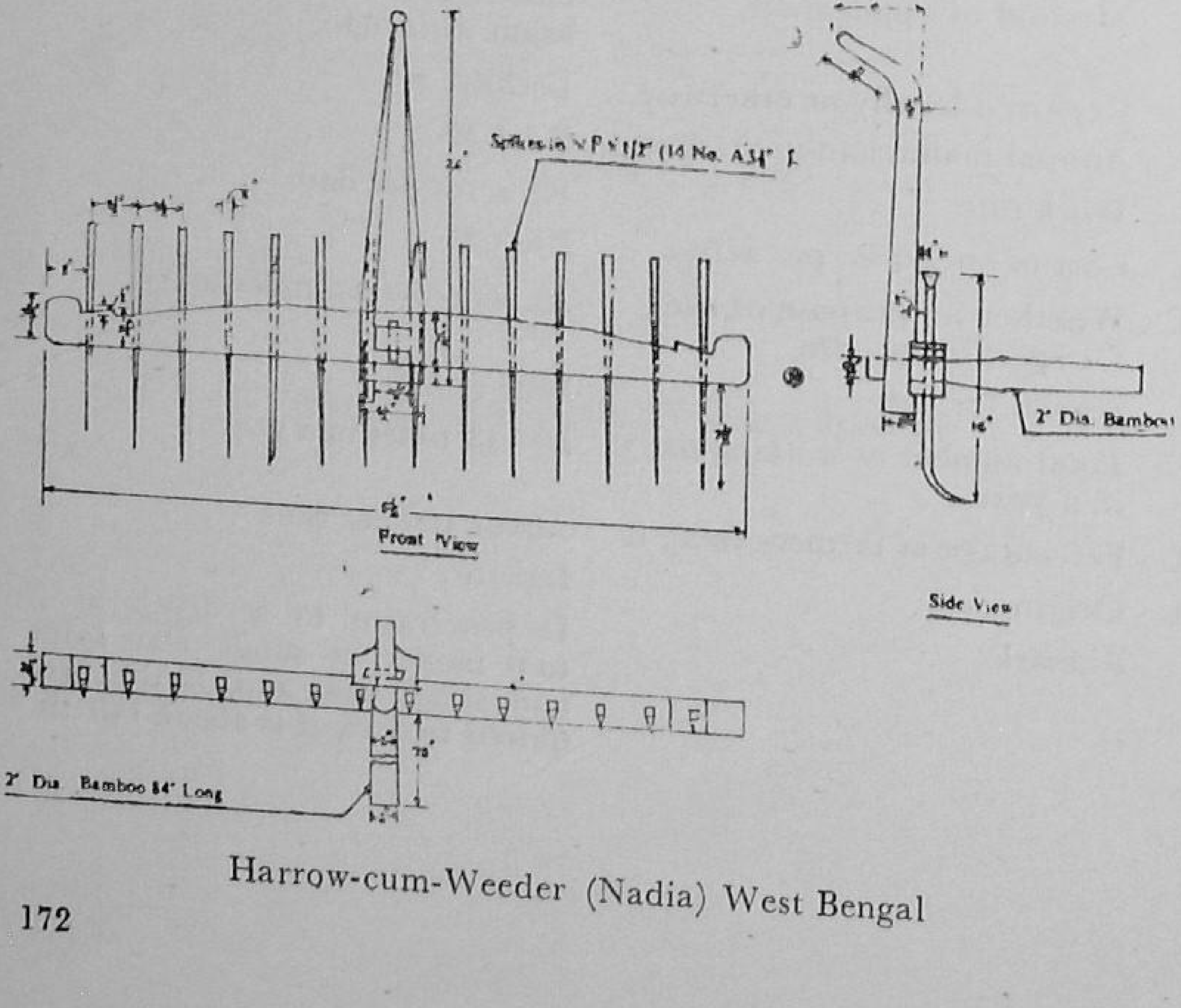
HARROWS

Blade Harrow—Bakhar (Vindhya Pradesh)

1.	Classification	Land preparation implement
2.	Name (English and local)	Blade harrow—Bakhar
3.	Name of the State and District	Vindhya Pradesh—Datia Panna, Shahdol, Chatarpur, Tikamgarh
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Wood and fabricated iron
6.	Weight of the implement	60 lb.
	(i) Iron part	4 lb.
	(ii) Wooden part	56 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 6 to 18
9.	Service life	2 years
10.	Usage	Used to eradicate *kans* and other wild grasses for seed bed preparation of various crops like, paddy, *kodon*, *bajra*, sunhemp, *jowar*, *sawan*, cotton, wheat, etc.
11.	Method of application	Hitched to the yoke by tying the beam with rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1.50
14.	Work rate	1.5 acres per day
15.	Cost of operation per acre	Rs. 3.25
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season for use	Year round
18.	Total number of working days in a year	10—13 times in a year
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	It penetrates to a depth of 2 to 6 inches in sandy clay loam and sandy loam and the draft required to draw it is about 175 lb.

PLATE 58





Harrow-cum-Weeder (Nadia) West Bengal

HARROWS

Harrow-cum-Weeder—Bida (West Bengal)

1.	Classification	Land preparation implement
2.	Name (English and local)	Harrow-cum-Weeder—Bida
3.	Name of the State and District	West Bengal—24 Parganas, Nadia, Howrah, Hoogly, Burdwan, Midnapur, Birbhum, Murshidabad, Maldah, West Dinajpur and Cooch Behar
4	Manufacturers and source of availability	Local artisans
5.	Materials used	Babul, Sal wood and M.S. flat
6.	Weight of the implement	45 lb. to 50 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 15
9.	Service life	5 years
10.	Usage	It is used for thinning broadcast seedlings of jute and paddy
11.	Method of application	It is hitched to the yoke by means of a beam and ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 1
14.	Work rate	6 acres per day
15.	Cost of operation per acre	Rs. 0.75
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	Used for about 7 times in a year
19.	Percentage of farmers using it	About 60 per cent
20.	Origin	Indian
11.	Remarks	Its work in taking out the weeds is very effective. While worked as a harrow it functions as a rake to a certain extent in collecting the uprooted seedlings and weeds. It penetrates in clay loam soil to a depth ranging from 1 to 3 inches. The average draft is 110 to 130 lb.

SECTION IV

HOES IN USE IN DIFFERENT STATES

HOES AND CULTIVATORS

The 'hoe' is an all purpose farm implement used for many cultural operations. It is used in its various forms for preparing small seed beds, forming ridges, bunds, water courses and channels. It is also used for removing stumps of crops, for harvesting root crops such as potato and groundnut and for thinning of broadcast as well as drilled crops.

From the various survey reports, it is found that in the North the most common hand tool for hoeing purposes is the hand hoe (*Khurpi*) or some variation of it, and in the South the weeding hoe (*Kalai Kothi*) (DRG.-44). These must have been the first hand tools invented for hoeing. The single hand weeding hoe consists of a wooden handle to which an iron or steel blade is fixed. The shape and size of the handle and blade varies from region to region. They can be conveniently used in a squatting position.

A hand or weeding hoe has a limited capacity and can control only small areas. To overcome this a slightly heavier two handed hoe such as the Gudali (*Kodali*) and Mamutty must have been devised. The two handed hoe consists of a wooden handle of varying lengths to which a flat iron blade is attached. The size of the handles as well as the size and shape of the blades show considerable variations. For heavy digging the blades are longer and narrower with thicker sections. While standing the length of the handle of the hoe is longer and the angle between the blade and the handle is nearly a right angle. Different angles are necessary for the penetration of the blade in the different working positions. With these implements one could exert more force, dig deeper and also remove thickly rooted weeds, grasses and stumps. These are also more efficient for digging and for making ridges, trenches and water channels. These two-handed implements are used in an upright or slightly bent position and hence offer ease of handling in addition to greater work capacity.

To control larger areas, it is necessary obviously to use bullock drawn hoes. These have larger spade-like blades, two or more in number, directly attached to a head piece which is provided with shaft poles for convenience of yoking to the animals. Another variant in design is a horizontally carried blade attached to the head piece and is similar in appearance to a small blade harrow.

The size of the blade is governed by crop spacing.

It is now a very common practice in some areas of Madhya Pradesh, Madhya Bharat, Bombay State, Andhra Pradesh and Madras State to hitch two or three separate hoes to a common yoke to permit working in between several rows at a time. This enables larger areas to be covered. The blade hoes are generally used for interculturing of row-crops.

A variation of the blade hoe is the 'Slit Hoe' (DRG. 59) reported from Bombay State. This is used in the very early stages of plant growth, and requires skilful manipulation to avoid damage to the crop.

One type of blade scraper, which is reported as being commonly used in the Punjab for cutting the *Pohli* weeds is the one evolved from the *desi* plough. This has a two-foot blade directly attached to the body in place of the shoe. It is worked after the wheat crop has been harvested to eradicate *Pohli* weed.

Apart from the above indigenous types of hoes, the following hoes of a more recent origin are gaining popularity on account of the ease of operation and better performance and work output :

1. Shovel-hand operated
2. Tyned hoe which has two or more sturdy tynes instead of a blade
3. Combination hand hoe where a spade and a three tyned rake are made in one piece
4. Wheel hoe having a single wheel carriage carrying a number of tynes. This is operated by a man who pushes it in between the rows.

Shovels and combination hand hoes are gaining popularity on hill slopes where, besides hoeing, they are used for preparing seed beds also.

The wheel type hand hoe has been found more suitable for inter-row cultivation where crops are sown in lines and spacing between rows permits its working.

The weight of one handed hoe varies from 1/2 to 2 lb. The price varies from Re. 0.25 to 0.75. The weight of the double handed hoe varies from 2 lb. to 8 lb. Their price is between Rs. 1 to 20. Bullock drawn hoes vary in weight from 15 to 40 lb. and the price from Rs. 5 to 50.

All the indigenous hand and bullock drawn hoes are generally manufactured by the village artisans, the materials of construction being supplied by the farmers themselves or purchased locally. Wood that is locally available is invariably used in the construction of handles, beams, head pieces, prongs etc., and steel or mild steel is used for

the blades. The steel blades are usually tempered after forging to shape. The services of artisans in rural areas are usually paid in kind. The implements manufactured by the urban artisans are sold for cash.

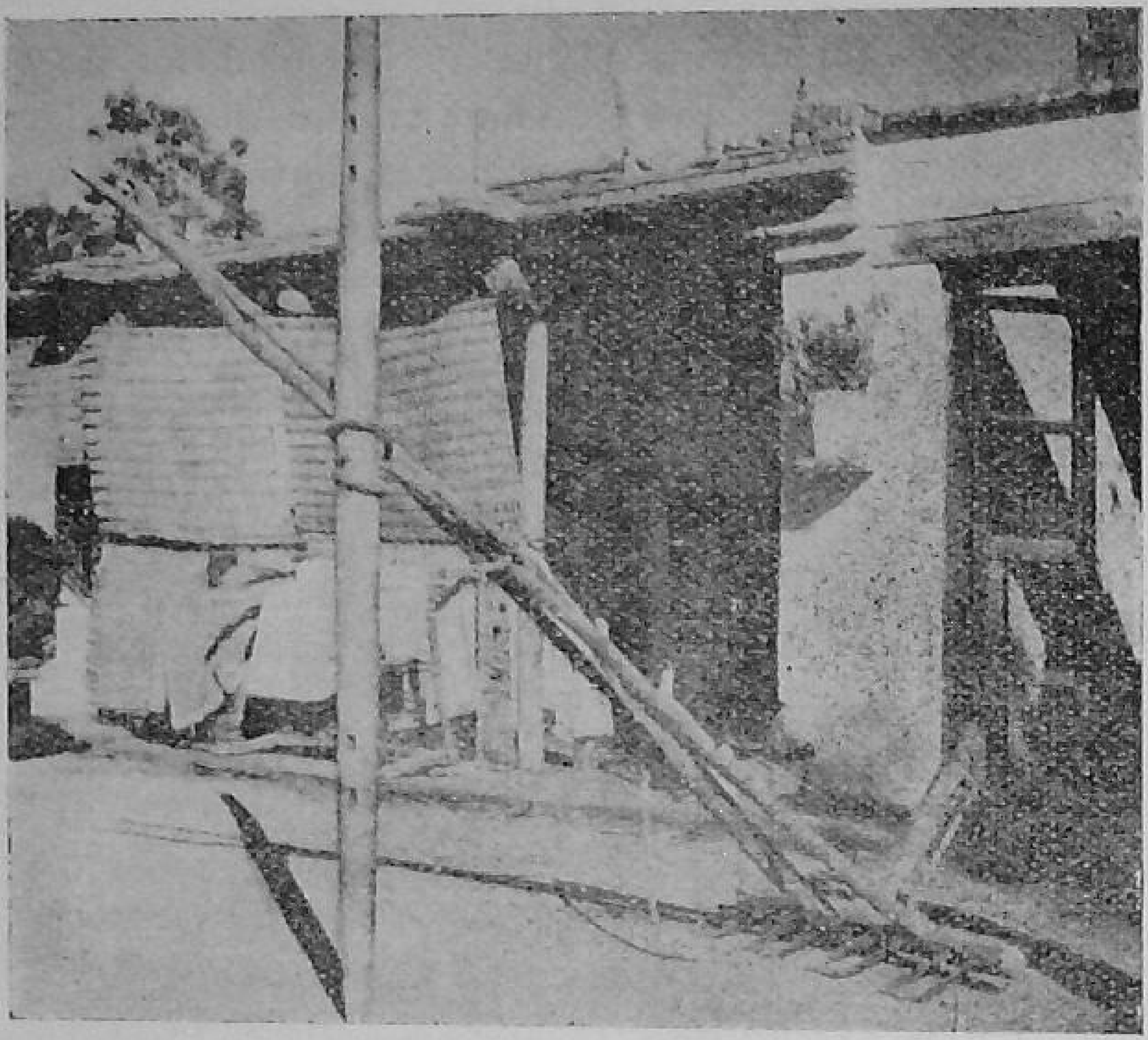
CULTIVATORS

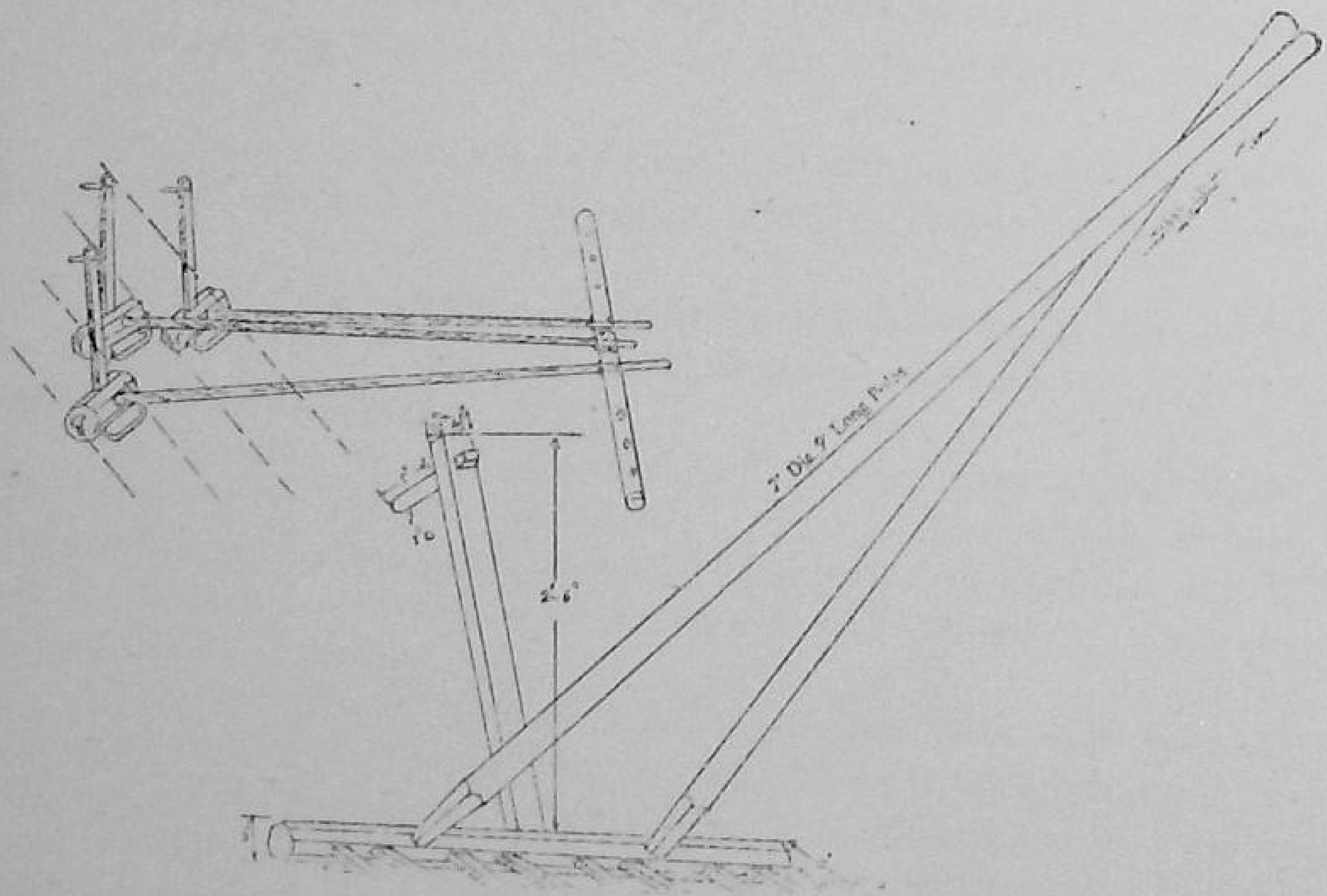
Cultivators are implements primarily intended for interculture operations in between the rows. These are usually provided with sweeps or shovels which work in the soil at shallow depths.

Thirty one implements have been reported under this classification from seven States.

On closer examination of the reports, however, it was found that they are in fact hoes or harrows and hence have been classified as such. There is no indigenous implement reported during this survey which could be correctly classified as a cultivator.

PLATE 59



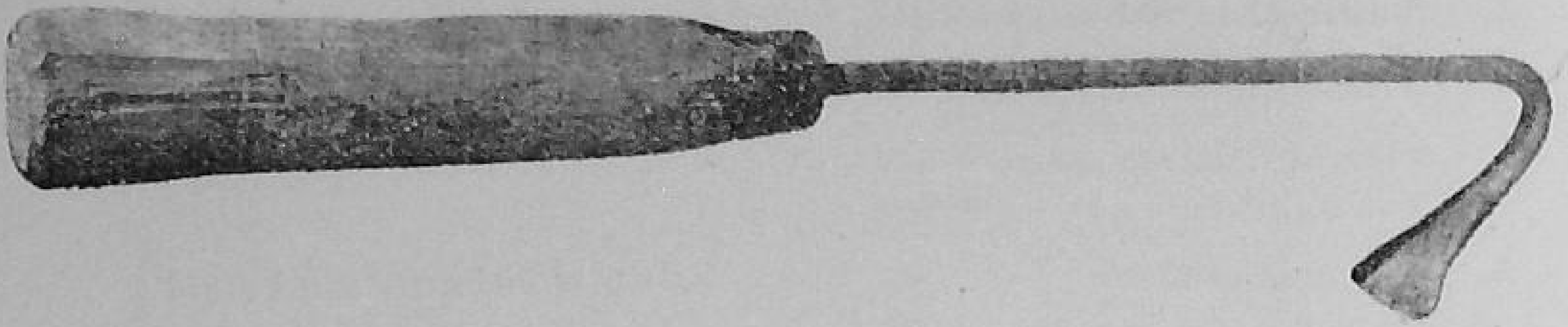


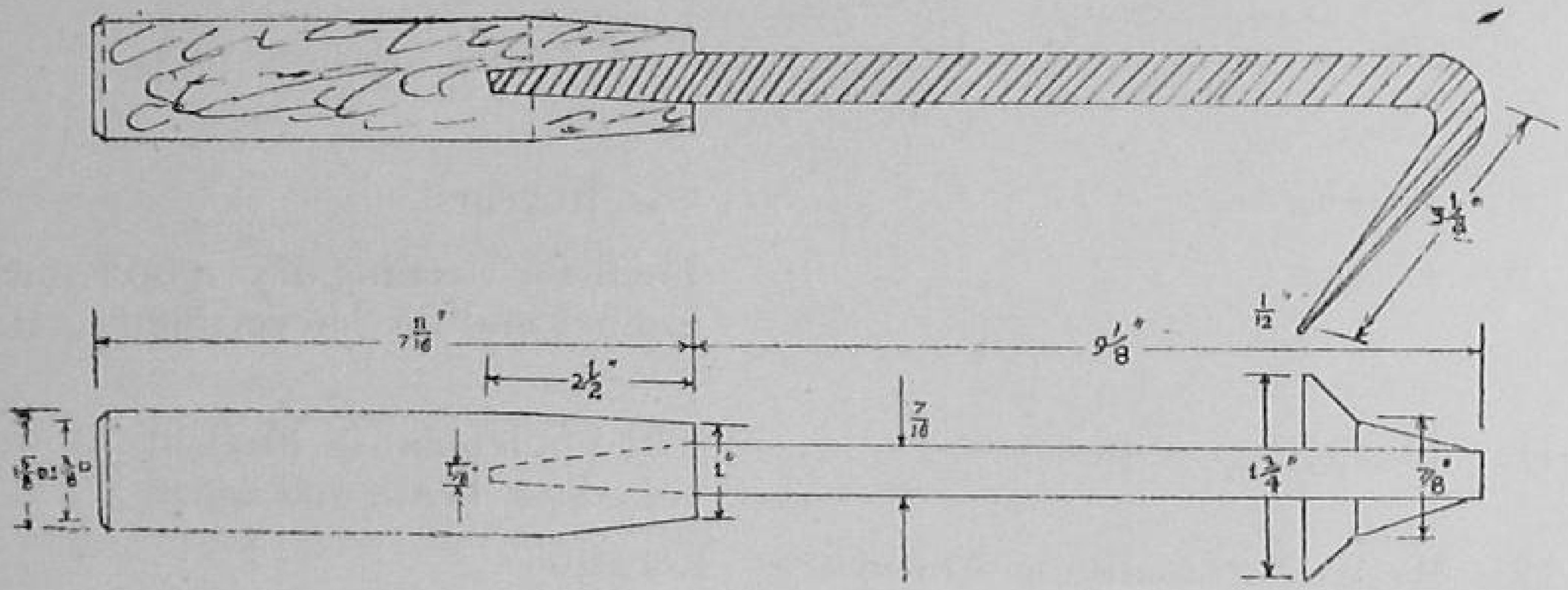
Four-Blade Hoe (Guntaka) Andhra Pradesh

HOES

Four-Blade Hoe—Guntaka (Andhra Pradesh)

1.	Classification	Interculturing implement
2.	Name (English and local)	Four-blade hoe—Guntaka
3.	Name of the State and District	Andhra—Kurnool
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Babul wood and mild steel
6.	Weight of the implement	59 lb.
	(i) Iron part	32 lb.
	(ii) Wooden part	27 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 20
9.	Service life	6 to 10 years
10.	Usage	Used for weeding dry crops sown in lines and for harvesting groundnut
11.	Method of application	The implement is hitched to the yoke by a beam and ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	5 acres per day
15.	Cost of operation per acre	Re. 1.00
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 30 per cent
20.	Origin	Indian
21.	Remarks	When used for harvesting groundnut this requires two pairs of bullocks. The average draft is 260 to 320 lb.





Hand Hoe (Gaya) Bihar

HOES

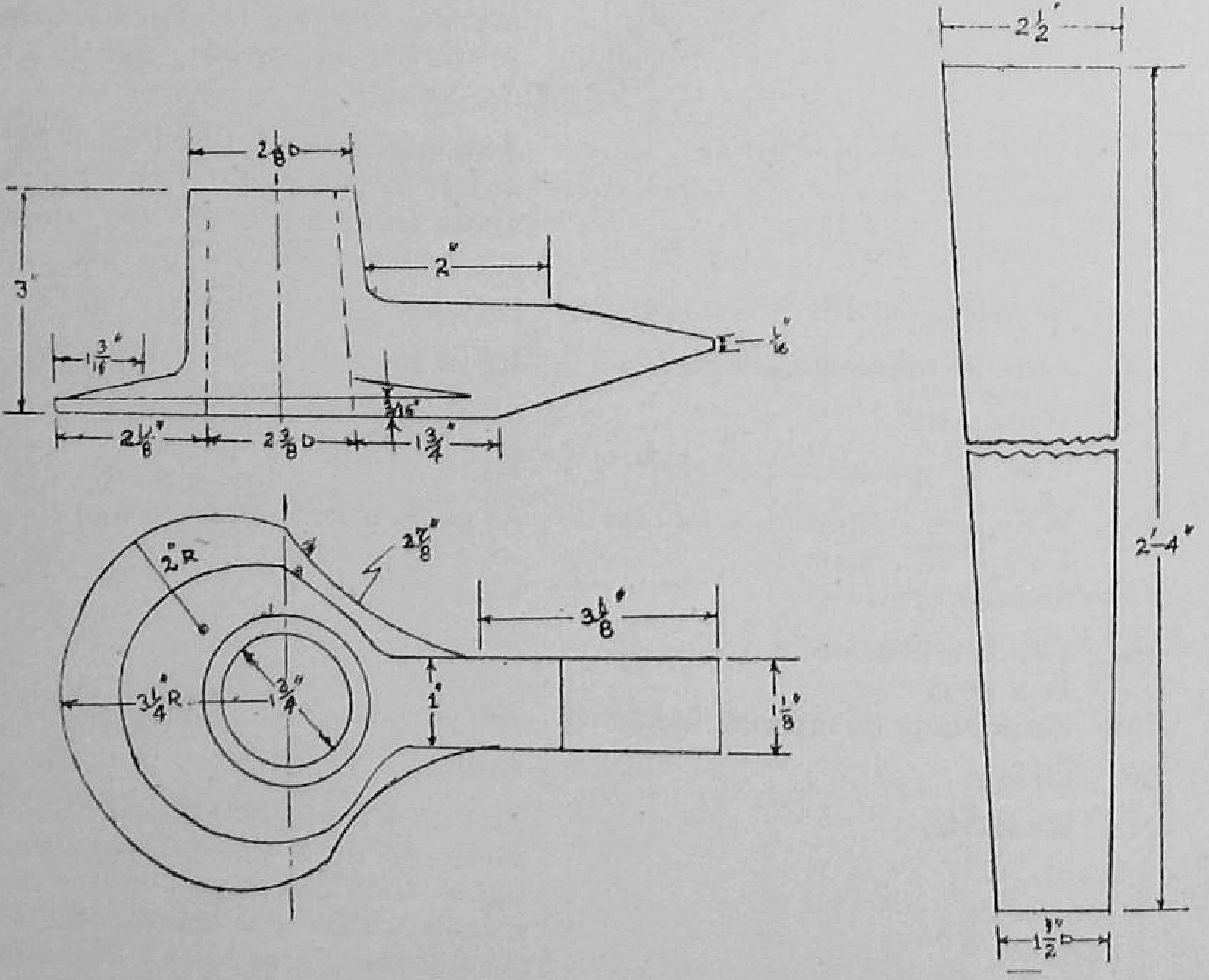
Hand Hoe (Bihar)

1.	Classification	Interculture implement
2.	Name (English and local)	Hand hoe—Tekari
3.	Name of the State and District	Bihar—Gaya, Monghyr
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Scrap steel, wood or bamboo
6.	Weight of the implement	1 to 3 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One man
8.	Cost	Re. 0.25
9.	Service life	2 years
10.	Usage	Used for hoeing paddy, wheat and other close growing crops
11.	Method of application	It is held by the right hand and allowed to fall on the ground with some pressure and pulled towards the operator
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	0.1 acre per day
15.	Cost of operation per acre	Rs. 8 to 9
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Throughout the year
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	This implement is used on alluvial soil. Average depth of penetration is 1 to 2 inches.

HOES

Spade—Kodali, Korni (Bihar)

1.	Classification	Hoeing implement
2.	Name (English and local)	Spade—Kodali, Korni
3.	Name of the State and District	Bihar—Santhal Pargana, Muzaffarpur, Hazaribagh
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Wood or bamboo for handle and steel for blade
6.	Weight of the implement	6 to 8 lb.
	(i) Iron part	4 to 6 lb.
	(ii) Wooden part	1 to 3 lb.
7.	Operating power	One person (manually)
8.	Cost	Rs. 3 to 6
9.	Service life	2 to 3 years
10.	Usage	Used for digging earth, for making bunds, tillage operations, such as making furrows, ridges and hoeing purposes in paddy, maize and vegetables
11.	Method of application	The implement is lifted with both hands by the person and by the application of force, the cutting edge penetrates into the soil
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.25 to 0.50
14.	Work rate	0.125 to 0.166 acre per day
15.	Cost of operation per acre	Rs. 8 to 10
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	The depth of penetration varies from 3 to 4 inches depending upon the force applied by the person. This type is also used in the following areas. (1) Maldah, Nadia and Murshidabad Districts of West Bengal.



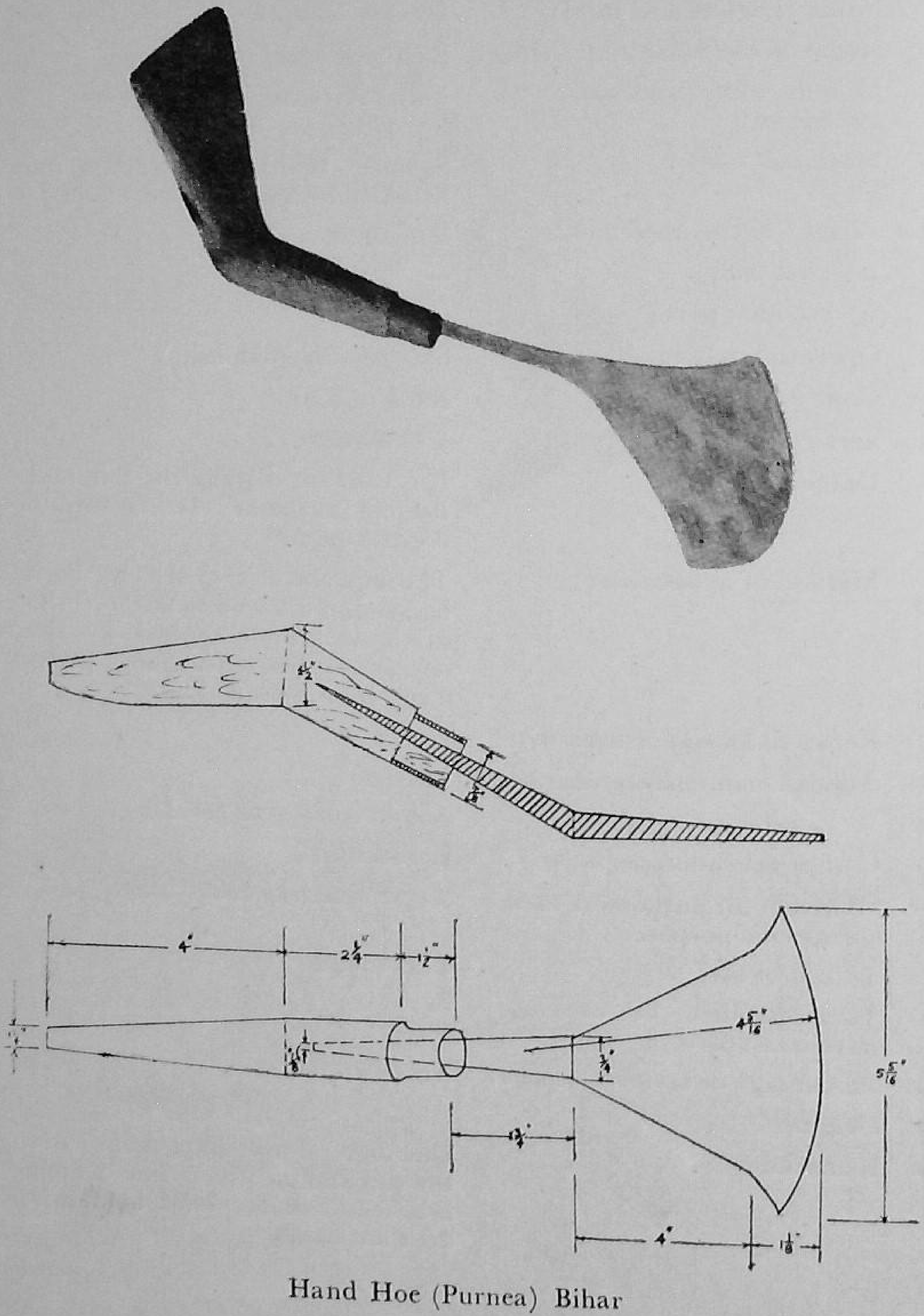
Spade (Ranchi) Bihar

HOES

Spade—Kodali (Bihar)

1.	Classification	Hoeing implement
2.	Name (English and local)	Spade—Kodali
3.	Name of the State and District	Bihar—Ranchi
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Sakhua wood or bamboo for handle and mild steel for blade
6.	Weight of the implement	5 to 10 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One person (manually)
8.	Cost	Rs. 3 to 3.50
9.	Service life	3 to 4 years
10.	Usage	It is used for digging the soil and hoeing purposes. It is mainly used for paddy
11.	Method of application	The implement is raised by both hands and allowed to fall on the earth with force applied by the operator. The cutting edge penetrates into the soil
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.20
14.	Work rate	0.05 to 0.083 acre per day
15.	Cost of operation per acre	Rs. 12 to 18
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year.	—
19.	Percentage of farmers using it	About 40 per cent
20.	Origin	Indian
21.	Remarks	One side of the implement cuts the soil and the other side which is a semi-circular steel blade, is used for hoeing

PLATE 63

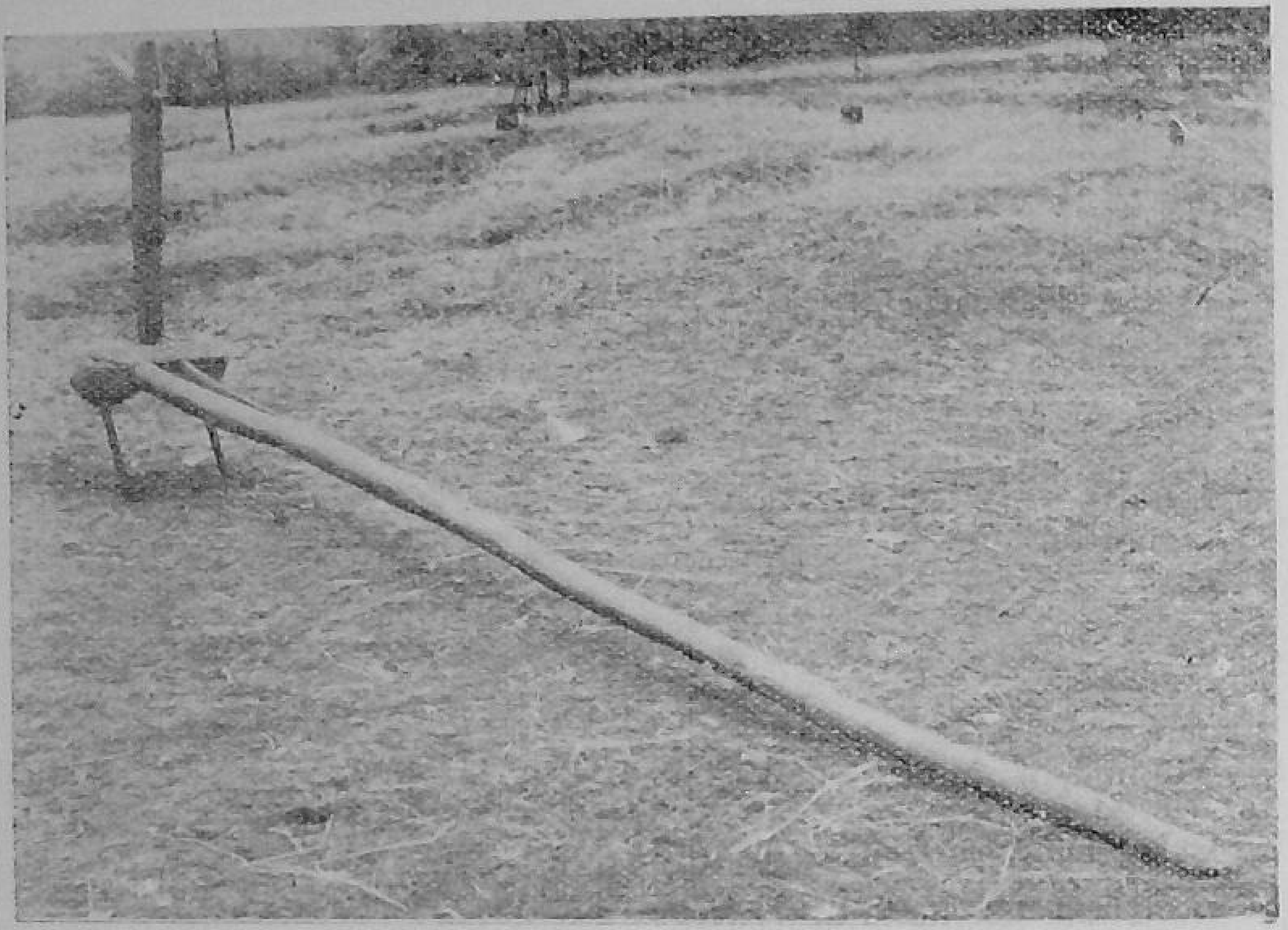


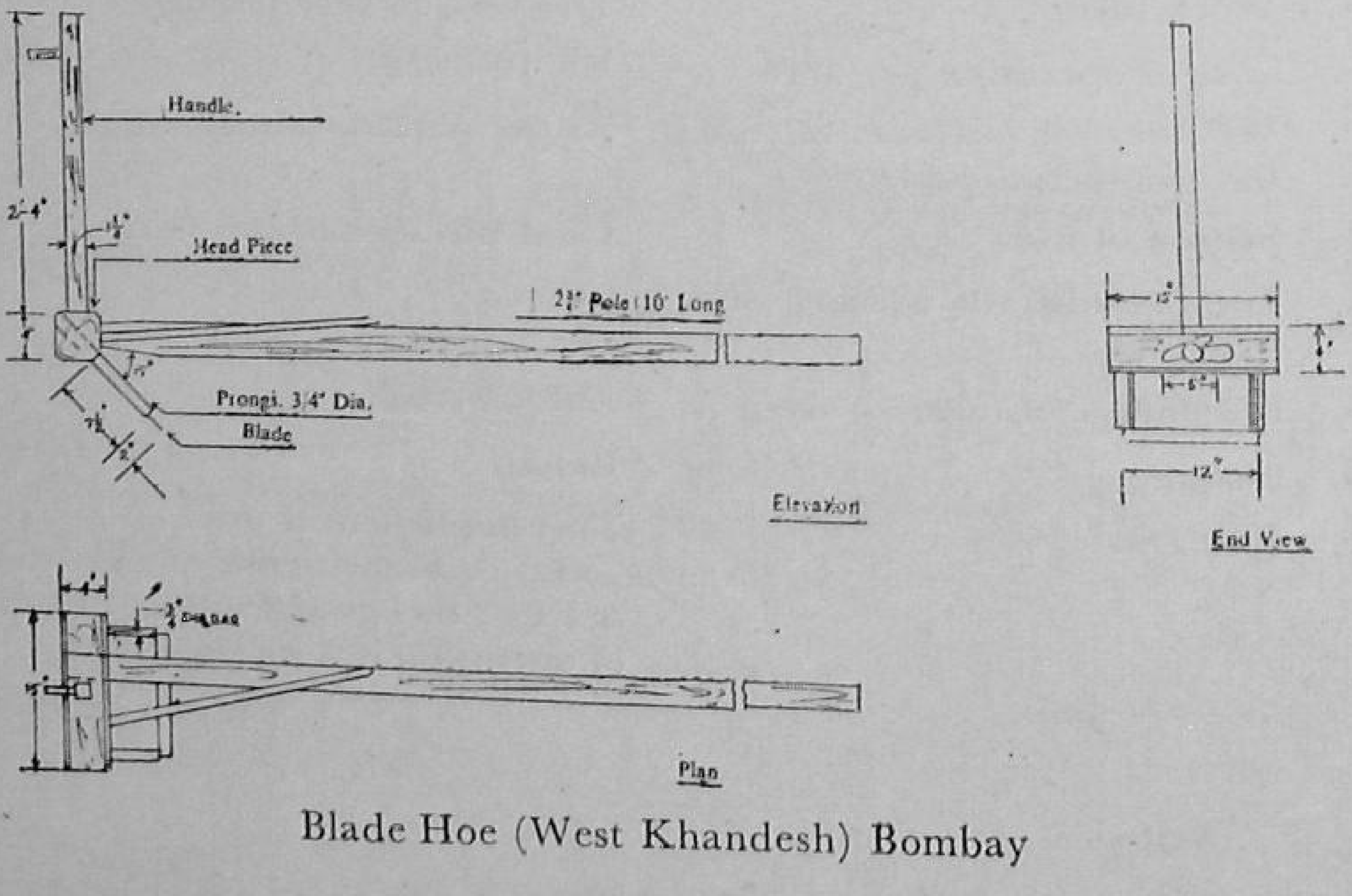
Hand Hoe (Purnea) Bihar

HOES

Hand Hoe—Khurpi—(Bihar)

1.	Classification	Interculture implement
2.	Name (English and local)	Hand hoe—Khurpi
3.	Name of the State and District	Bihar—Purnea, Hazaribagh, Monghyr
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Scrap steel or mild steel
6.	Weight of the implement	8 to 12 oz.
	(i) Iron part	6 to 10 oz.
	(ii) Wooden part	2 oz.
7.	Operating power	One man
8.	Cost	Re. 0.50 to 0.75
9.	Service life	2 to 3 years
10.	Usage	Used for hoeing
11.	Method of application	It is driven into the soil by the right hand and the weeds are removed by left hand
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	1/15 to 1/20 acre per day
15.	Cost of operation per acre	Rs. 10 to 12
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Used throughout the year
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	This implement is used on alluvial soils. Average depth of operation is 1 to 2 inches and average width of operation is 3 inches.



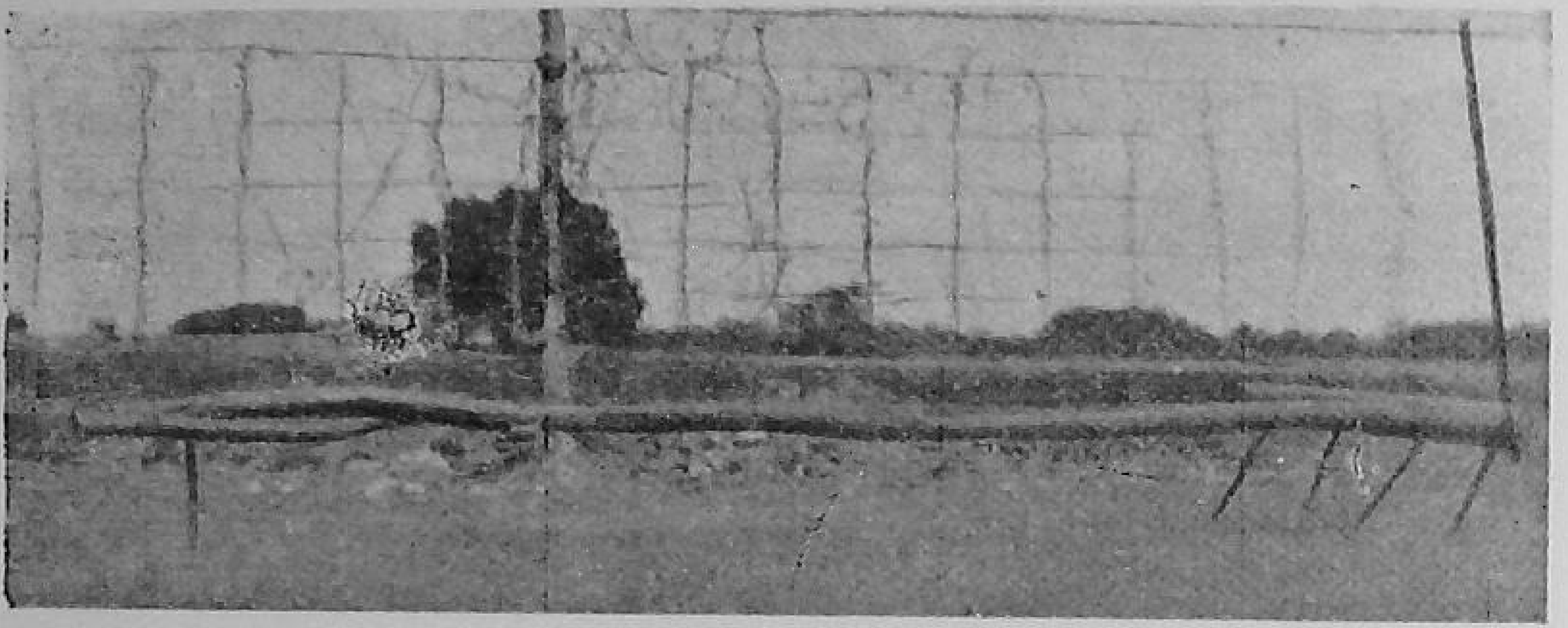


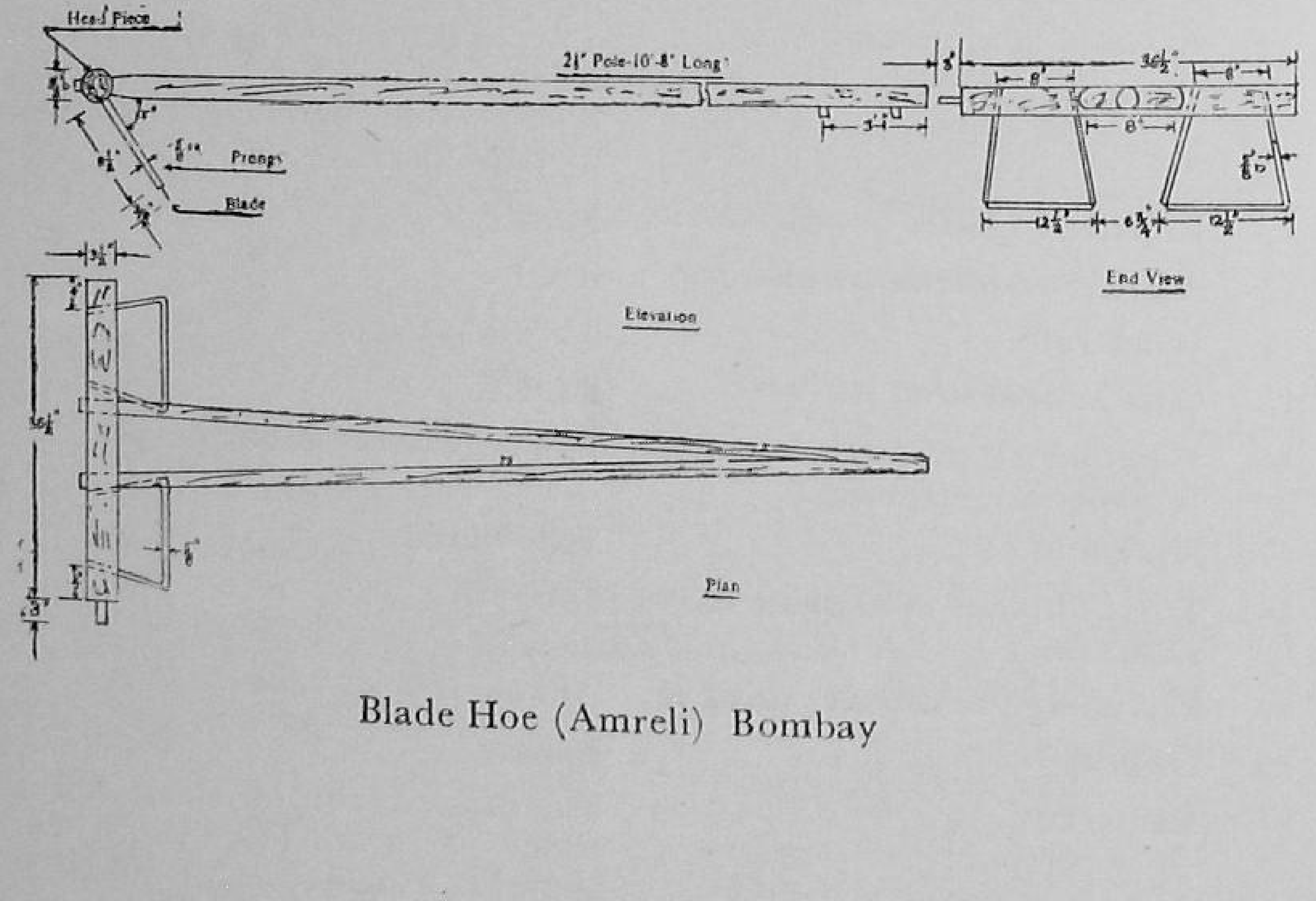
Blade Hoe (West Khandesh) Bombay

HOES

Blade Hoe—Kalpe (Bombay)

1.	Classification	Interculture implement
2.	Name (English and local)	Blade hoe—Kalpe
3.	Name of the State and District	Bombay—West Khandesh
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Babul, teak wood, and M.S.
6.	Weight of the implement	27 lb.
	(i) Iron part	3 lb.
	(ii) Wooden part	24 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 8
9.	Service life	10 years
10.	Usage	For intercultivating crops like *jowar*, cotton, gram and *dhana*
11.	Method of application	Two to three hoes are worked at a time. All of them are tied to a single yoke, and are controlled by three persons
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 1
14.	Work rate	3 acres per day
15.	Cost of operation per acre	Rs. 1.25
16.	Whether all purpose or used for specific purpose	As per remarks under usage.
17.	Season of use	Year round
18.	Total number of working days in a year	14 days
19.	Percentage of farmers using it	Almost 100 per cent
20.	Origin	Indian
21.	Remarks	The depth of cut in black soil is about 1 inch. The width of shovel is 2 inches.





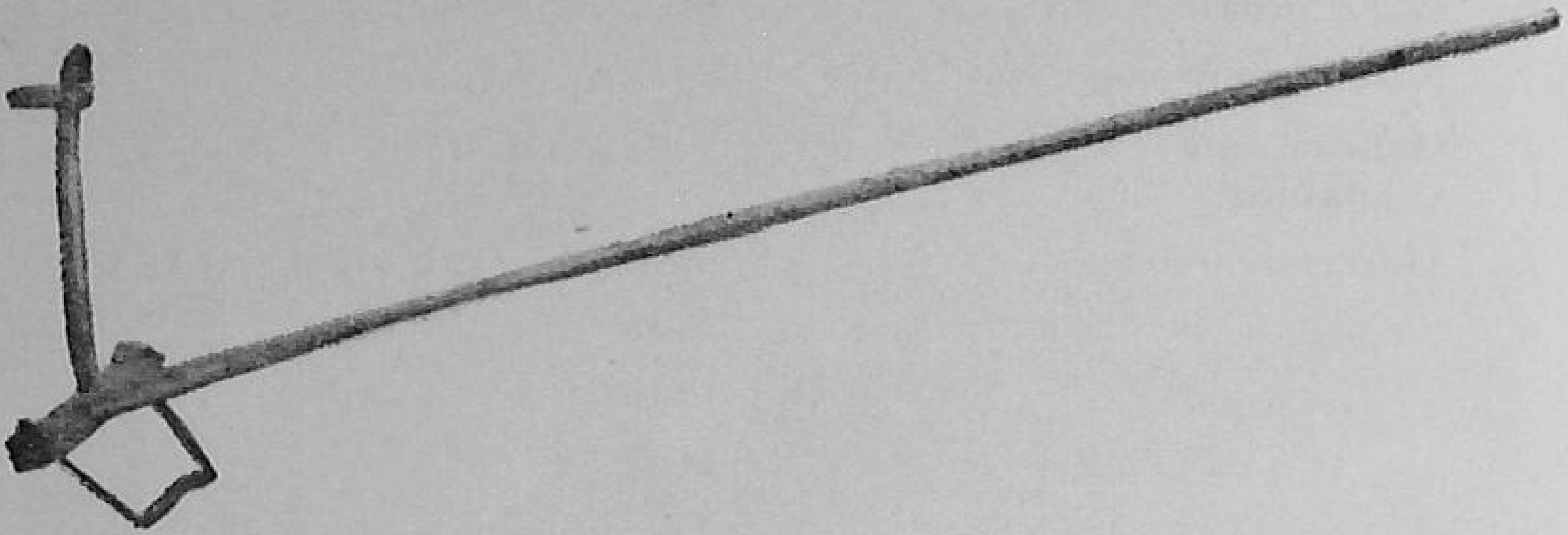
Blade Hoe (Amreli) Bombay

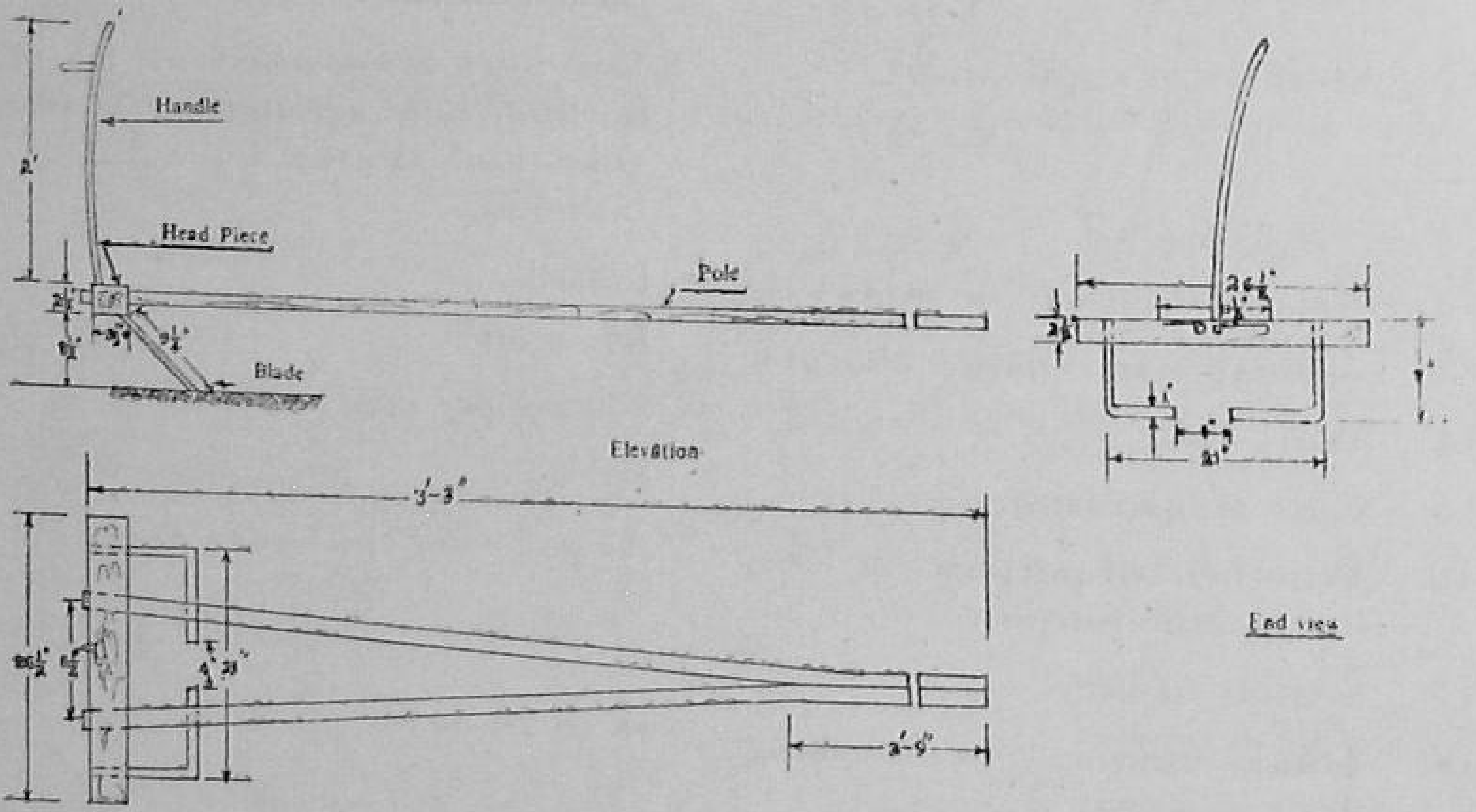
HOES

Blade Hoe—Beli (Bombay)

1.	Classification	Interculture implement
2.	Name (English and local)	Blade hoe—Beli
3	Name of the State and District	Bombay—Amerli
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Shisham, Teak wood and M.S.
6.	Weight of the implement	43 lb.
	(i) Iron part	12 lb.
	(ii) Wooden part	31 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 14
9.	Service life	5 years
10.	Usage	For interculture operation of *jowar* and *bajri*
11.	Method of application	Two hoes are worked at a time. Both of them are tied to a single yoke and drawn by a pair of bullocks
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.50
14.	Work rate	3 acres per day
15.	Cost of operation per acre	Rs. 2.75
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	18 to 20 days
19.	Percentage of farmers using it	Almost 100 per cent
20.	Origin	Indian
21.	Remarks	The average draft is about 84 lb. in black soil. The depth of working varies from 1 to 2 inches depending upon soil conditions.

PLATE 66



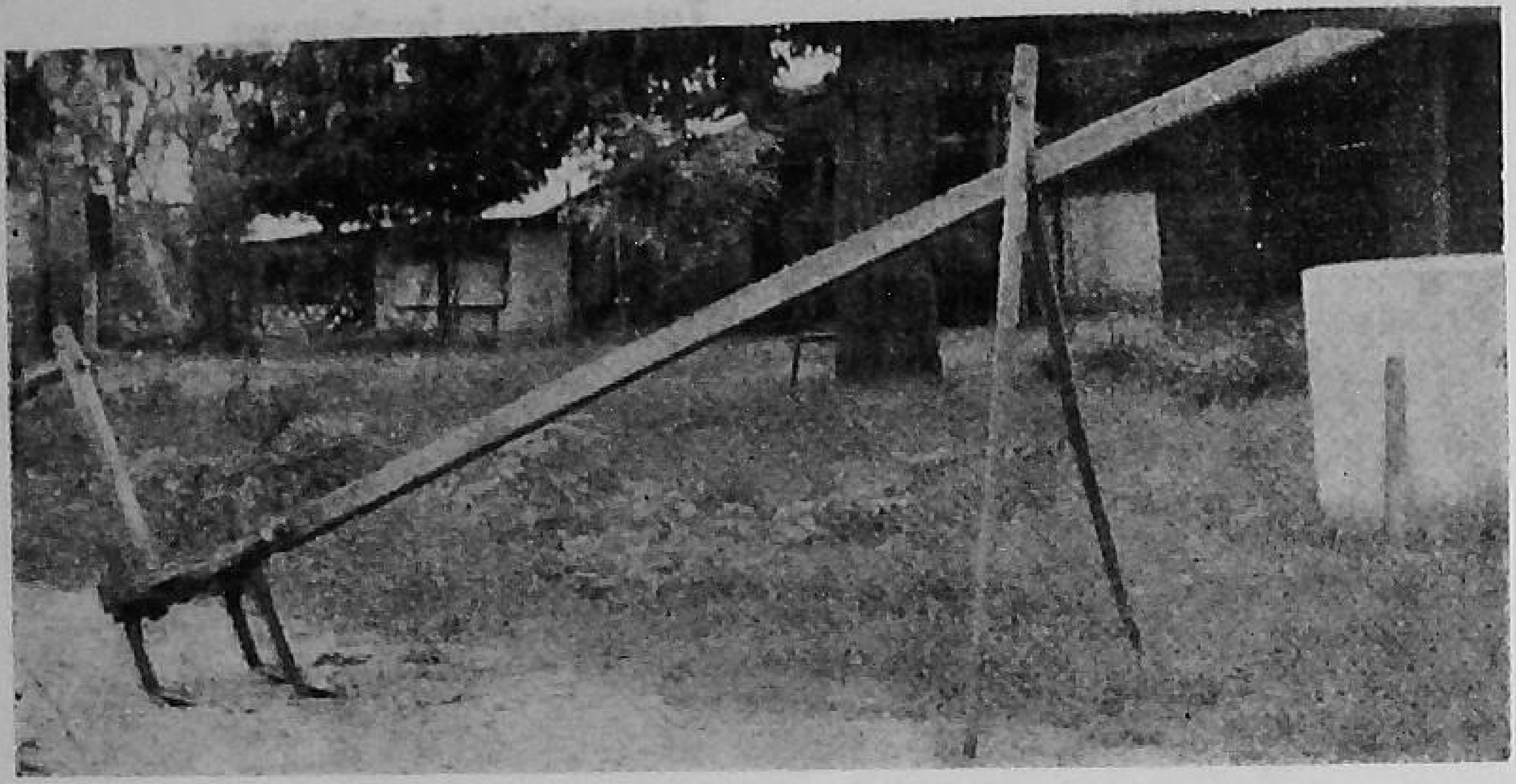


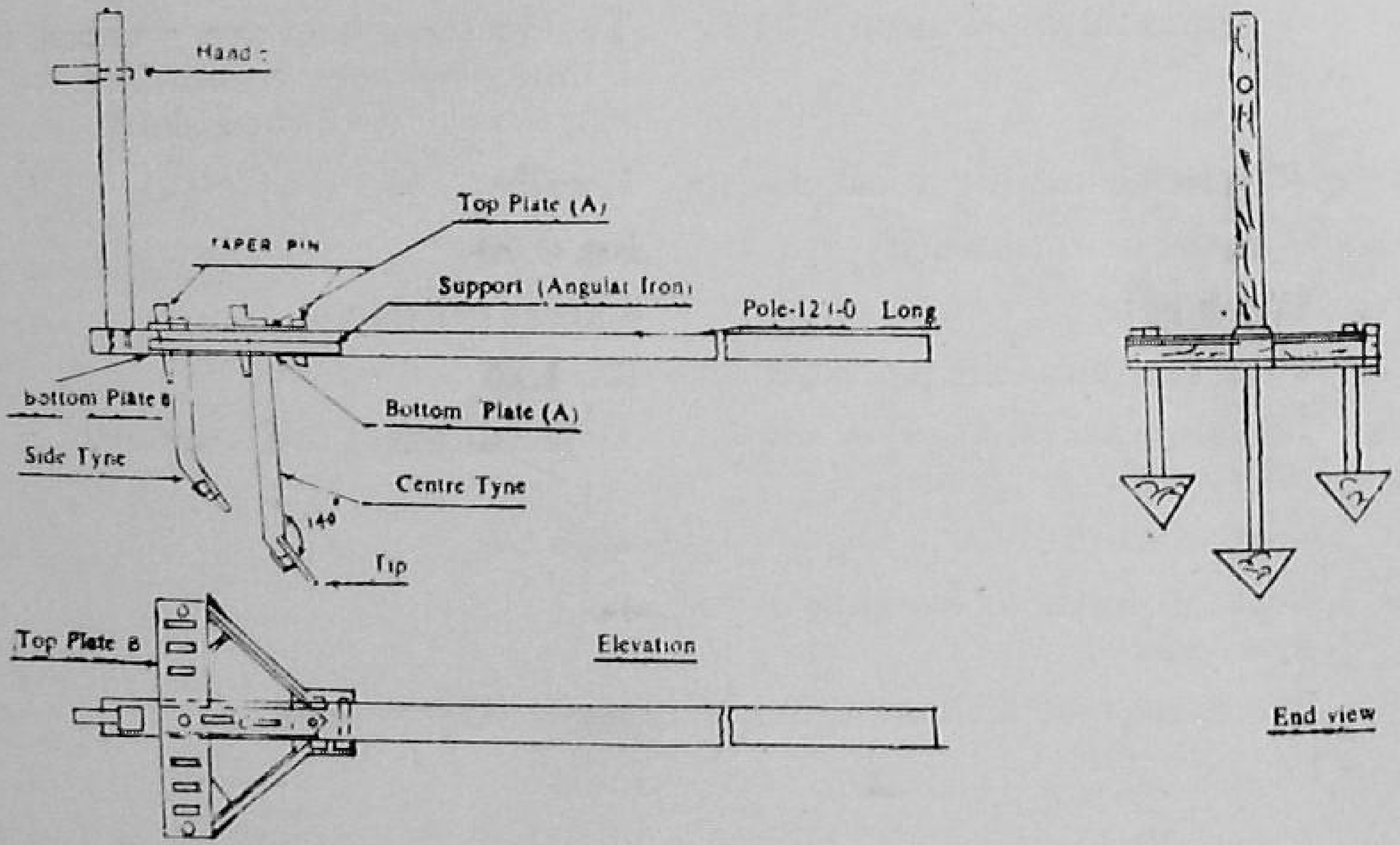
Slit Hoe (Poona) Bombay

HOES

Slit Hoe—Kolpa (Bombay)

1.	Classification	Interculture implement
2.	Name (English and local)	Slit hoe—Kolpa
3.	Name of the State and District	Bombay—Poona, Kolhapur
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Teak, Babul, bamboo and M.S.
6.	Weight of the implement	25 lb.
	(i) Iron part	5 lb.
	(ii) Wooden part	20 lb.
7.	Operating power	2 bullocks and 2 men
8.	Cost	Rs. 8
9.	Service life	5 years
10.	Usage	Used for interculture operations in crops like *jowar*, *bajri*, gram, etc.
11.	Method of application	Two or three hoes are worked at a time. All hoes are hitched to a single yoke with their shaft.
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance	Re. 0.50
14.	Work rate	4 acres per day
15.	Cost of operation per acre	Rs. 1.25
16.	Whether all purpose or used for specific purpose	As per remarks under usage.
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	Almost 100 per cent
20.	Origin	Indian
21.	Remarks	The average draft in black soils is about 56 lb. It penetrates into the soil to a depth of 1 to 2 inches depending upon soil conditions This type of hoe is also found in use in following areas. (1) Chitoor District of Andhra Pradesh (2) Coorg State.



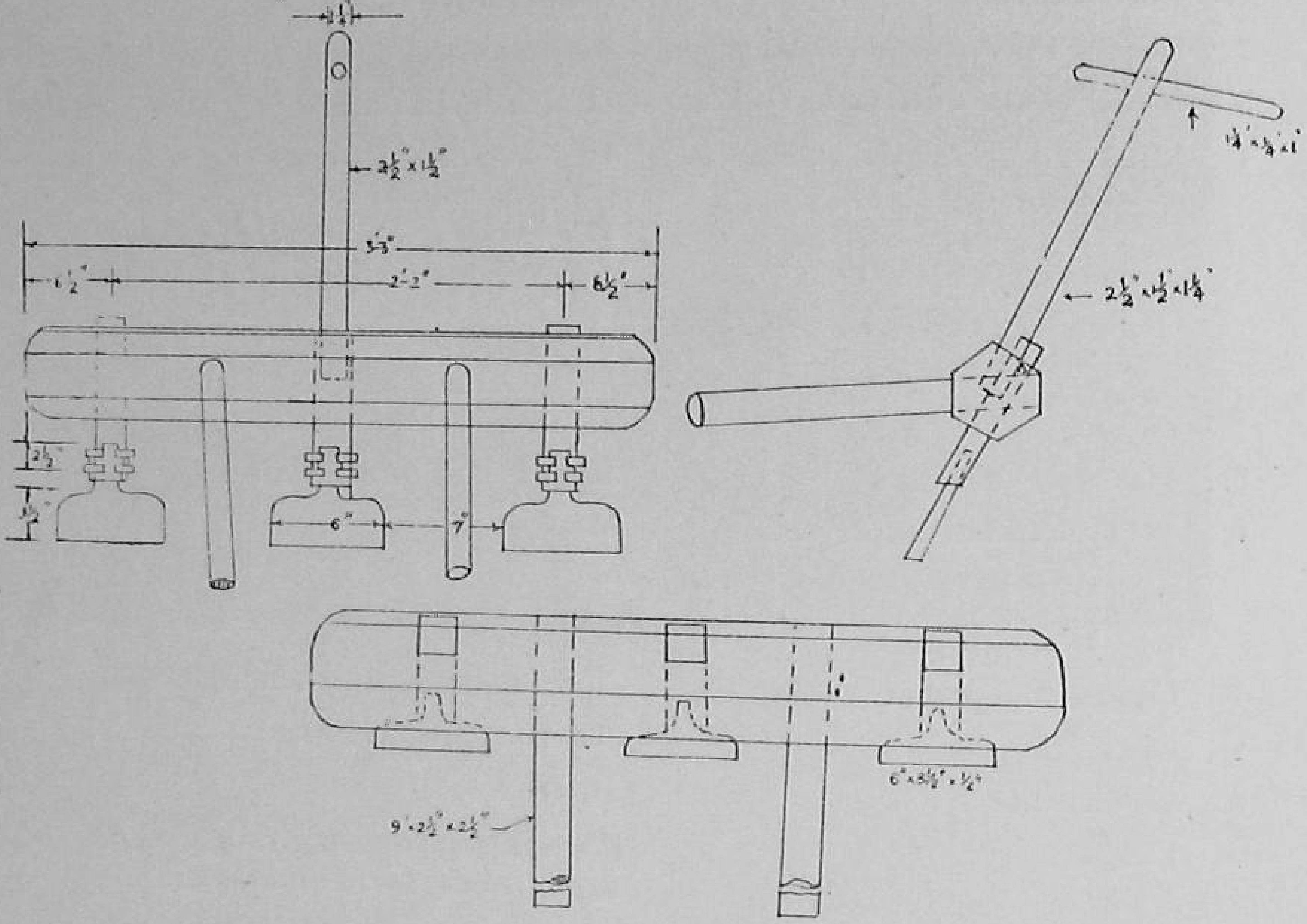


Baroda Hoe (Baroda) Bombay

HOES

Baroda Hoe (Bombay)

1.	Classification	Interculture implement
2.	Name (English and local)	Baroda hoe
3.	Name of the State and District	Bombay—Baroda
4	Manufacturers and source of availability	1. Messrs Danjibhai Gopalji, Panchal Anval—Distt. Surat 2. Messrs Ambika Agricultural Works, Opposite—Ramakrishan Flour Mill, Mehsana 3. Messrs Visnagar Kharedi Vechan Saugar at Visnagar, Distt. Mehsana
5.	Materials used	Babul, teak and mild steel
6.	Weight of the implement	55 lb.
	(i) Iron Part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 16 (without beam)
9.	Service life	10 years
10.	Usage	For intercultivating crops like *bajri*, *jowar*, *kodra* and *lang*
11.	Method of application	—
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 4
14.	Work rate	5 acres per day
15.	Cost of operation per acre	Rs. 1.25
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	37 days
19.	Percentage of farmers using it	Almost 100 per cent
20.	Origin	Indian
21.	Remarks	The average draft is 224 lb. The depth of penetration varies from 2 to 4 inches depending upon soil conditions.



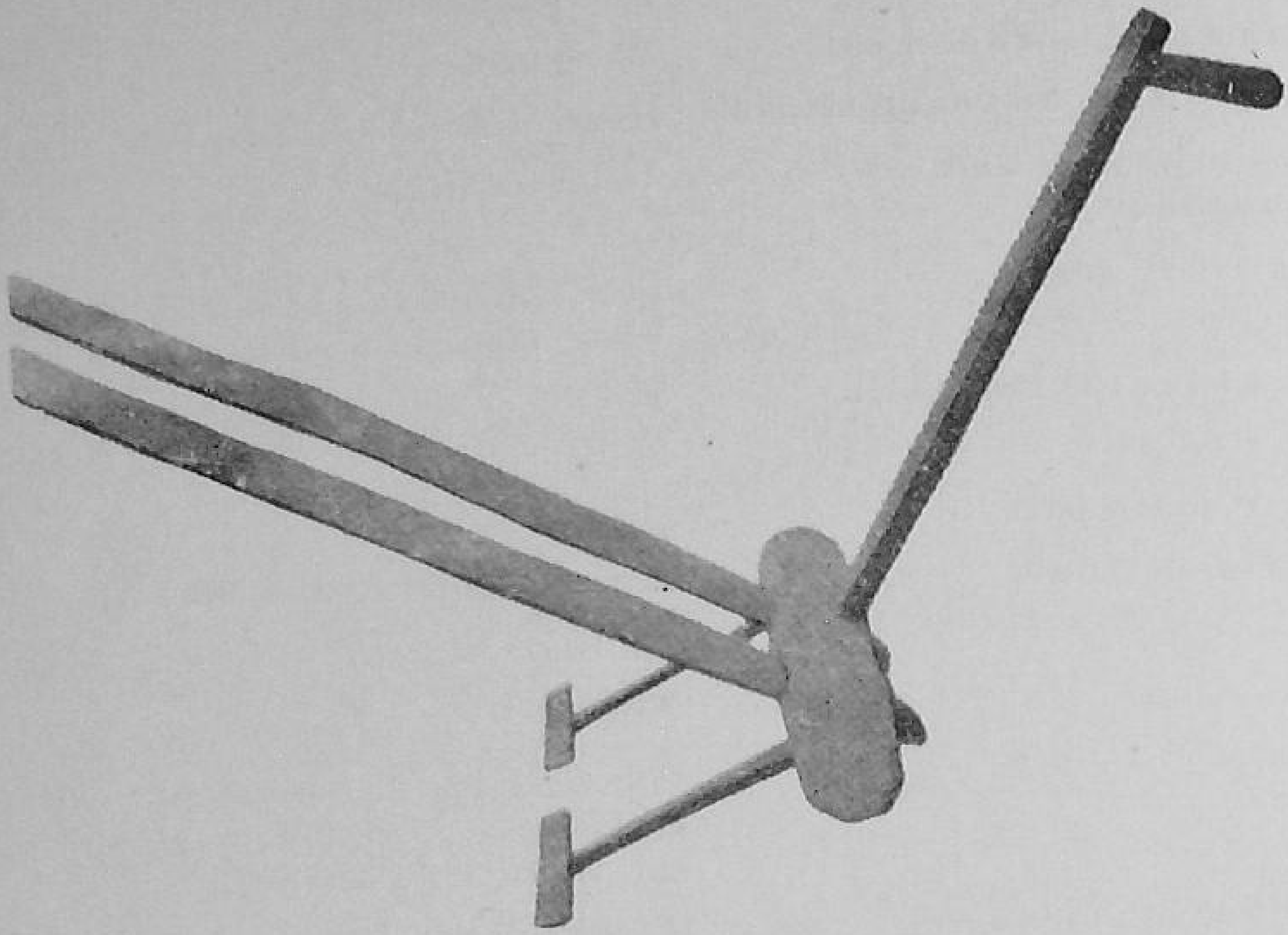
Blade Hoe (Nalgonda) Hyderabad

HOES

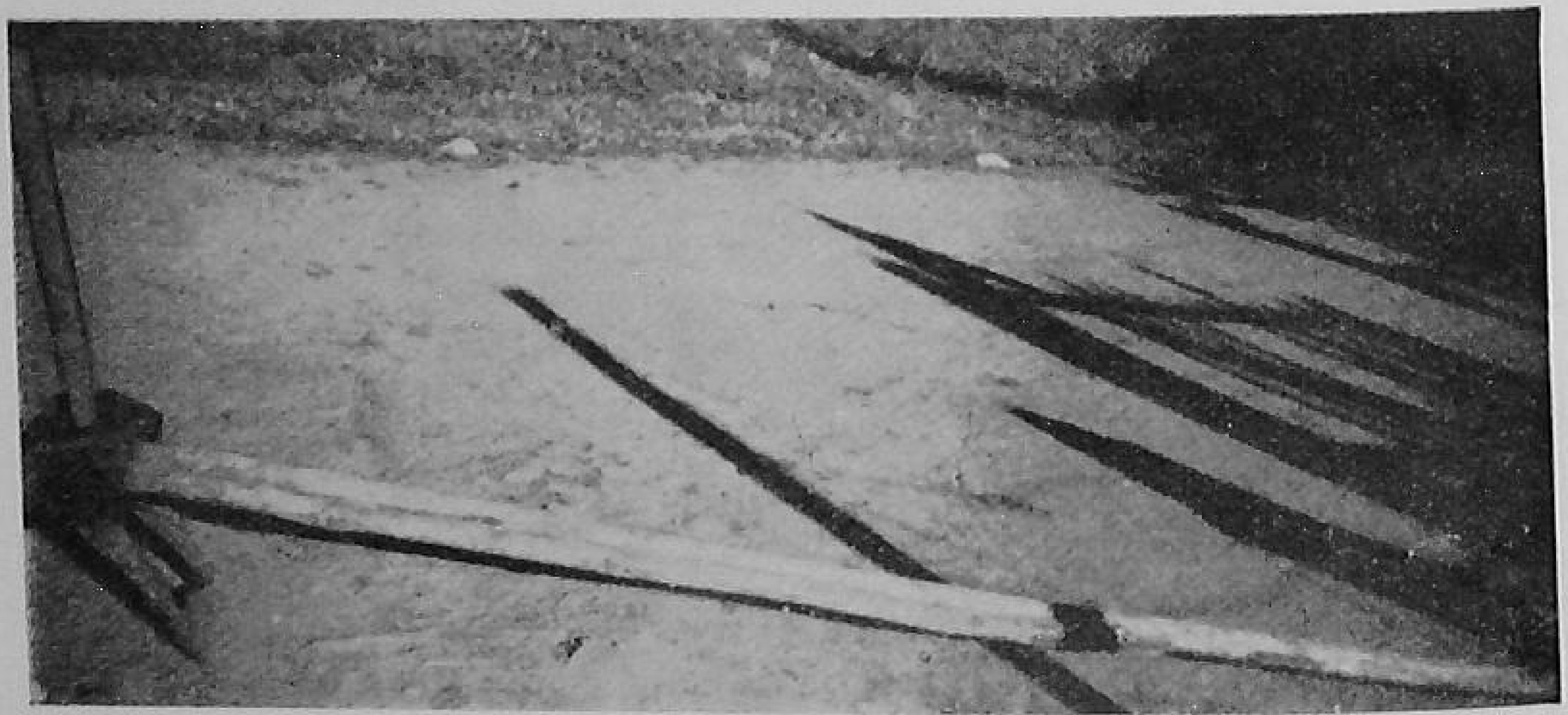
Blade Hoe—Danti (Hyderabad)

1.	Classification	Interculture implement
2.	Name (English and local)	Blade hoe—Danti
3.	Name of the State and District	Hyderabad—Nalgonda, Warrangal
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Body, tynes and handle of Babul wood, blade of mild steel sheet
6.	Weight of the implement	50 lb.
	(i) Iron part	13 lb.
	(ii) Wooden part	37 lb.
7.	Operating power	A pair of bullocks and one man
8.	Cost	Rs. 10 to 12
9.	Service life	2 years
10.	Usage	For seed bed preparation and interculture operation in groundnut, *jowar*, *bajra* and *mung*
11.	Method of application	Hitched to the yoke by means of a beam and ropes
12	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	—
14.	Work rate	1½ acres per day—Interculture 2 acres per day—Harrowing
15.	Cost of operation per acre	Rs. 2.50 —Interculture Rs. 2—Harrowing
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	Almost 100 per cent
20.	Origin	Indian
21.	Remarks	

PLATE 69



Blade Hoe (Khargone) Madhya Bharat

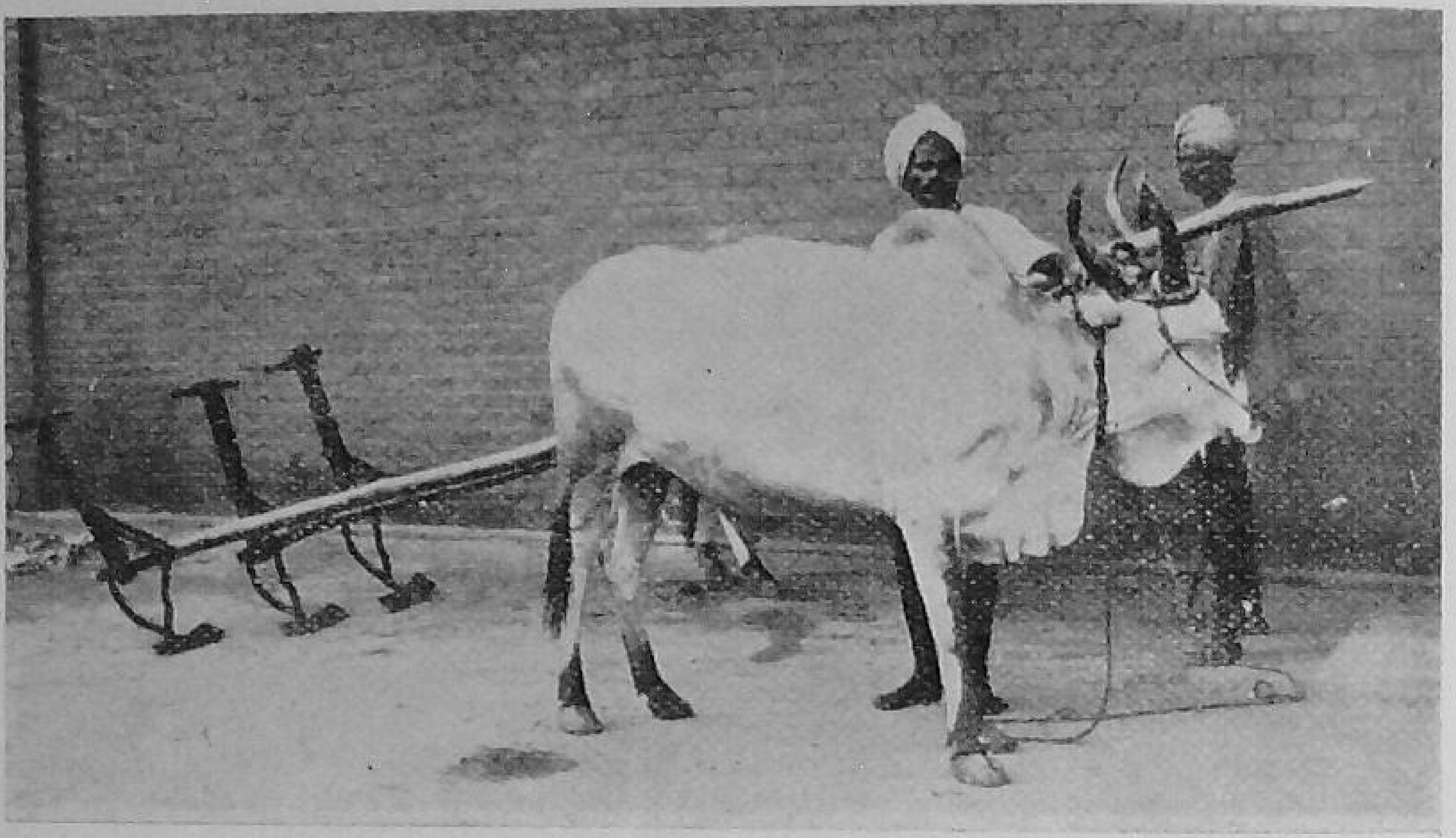


Blade Hoe With a Curved Blade

HOES

Blade Hoe—Kolpa (Madhya Bharat)

1.	Classification	Interculture implement
2.	Name (English and local)	Blade hoe – Kolpa
3.	Name of the State and District	Madhya Bharat—Khargone
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Babul, Sagwan wood and M.S.
6.	Weight of the implement	30 to 45 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and two men
8.	Cost	Rs. 21
9.	Service life	3 years
10.	Usage	Used for intercultivating *jowar*, cotton, groundnut, *tuar* etc. and other *kharif* crops
11.	Method of application	Hitched to the yoke by beams and ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.50
14.	Work rate	4 acres per day
15.	Cost of operation per acre	Rs. 1.50
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	*Kharif* season
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent nearly
20.	Origin	Indian
21.	Remarks	The average draft required to operate the implement varies from 100 lb. to 110 lb. The depth of working varies from 1 to 2 inches depending upon soil conditions

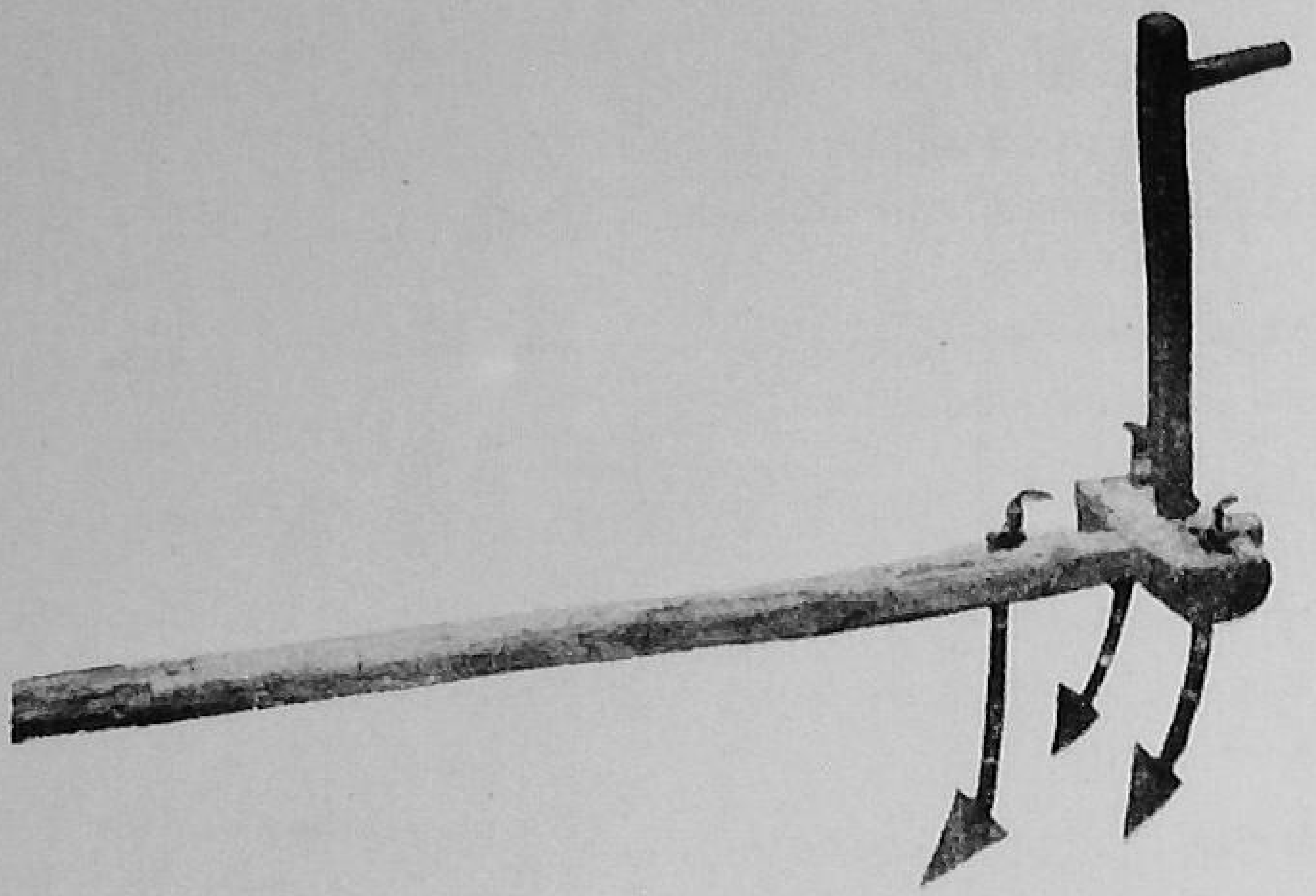


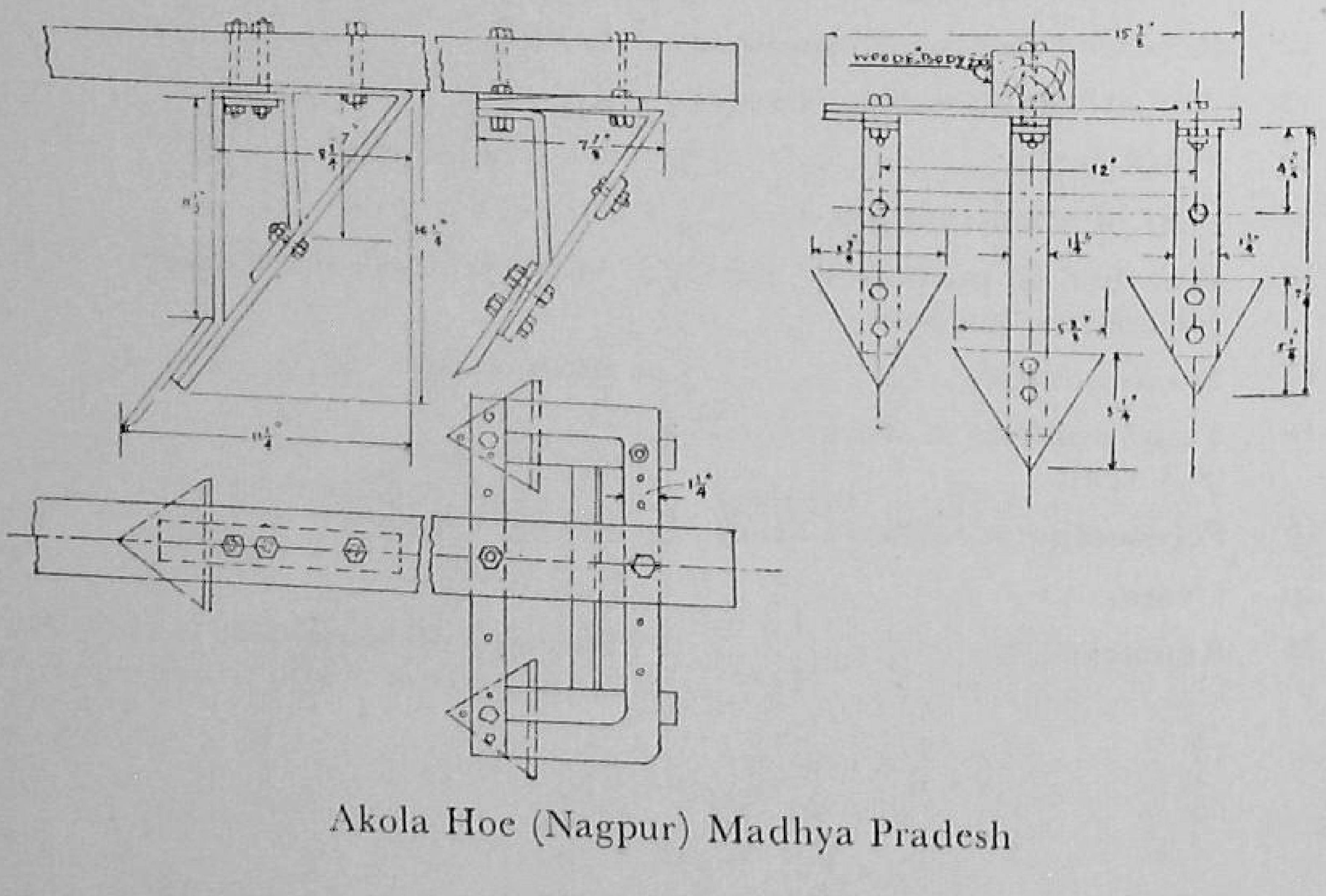
Blade Hoe (Khargone) Madhya Bharat

HOES

Blade Hoe—Jod Kolpa (Madhya Bharat)

1.	Classification	Interculture implement
2.	Name (English and local)	Blade hoe—Jod Kolpa
3.	Name of the State and District	Madhya Bharat—Khargone
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Same as Kolpa
6.	Weight of the implement	—
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and two persons
8.	Cost	Rs. 15 to 16
9.	Service life	—
10.	Usage	For interculture of *jowar*, groundnuts, cotton and other *kharif* crops
11.	Method of application	Same as Kolpa
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 1
14.	Work rate	0.7 acre per day
15.	Cost of operation per acre	Re. 0.75 to 1.00
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	*Kharif* season
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	This type of blade hoe is also in use in parts of Andhra Pradesh





Akola Hoe (Nagpur) Madhya Pradesh

HOES

Akola Hoe—Akola Dora (Madhya Pradesh)

1.	Classification	Interculture implement
2.	Name (English and local)	Akola hoe – Akola dora
3.	Name of the State and District	Madhya Pradesh – Nagpur
4.	Manufacturers and source of availability	Government Central Workshop, Nagpur
5.	Materials used	Iron and wood
6.	Weight of the implement	26 lb.
	(i) Iron part	17 lb.
	(ii) Wooden part	9 lb.
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 30 (for iron parts only)
9.	Service life	8 to 10 years
10.	Usage	Used for all *kharif* crops like, cotton, *jowar* etc.
11.	Method of application	A pair of this implement is always worked by a pair of bullocks. A long yoke locally called *Jadi* is used and the implement hoes in alternate rows
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	3 to 4 acres per day
15.	Cost of operation per acre	Rs. 1.25
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Throughout the year
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	Very few cultivators
20.	Origin	Indian
21.	Remarks	Average width covered at each cut is 6 inches and depth 1½ to 2 inches. Average pull is 93 lb.

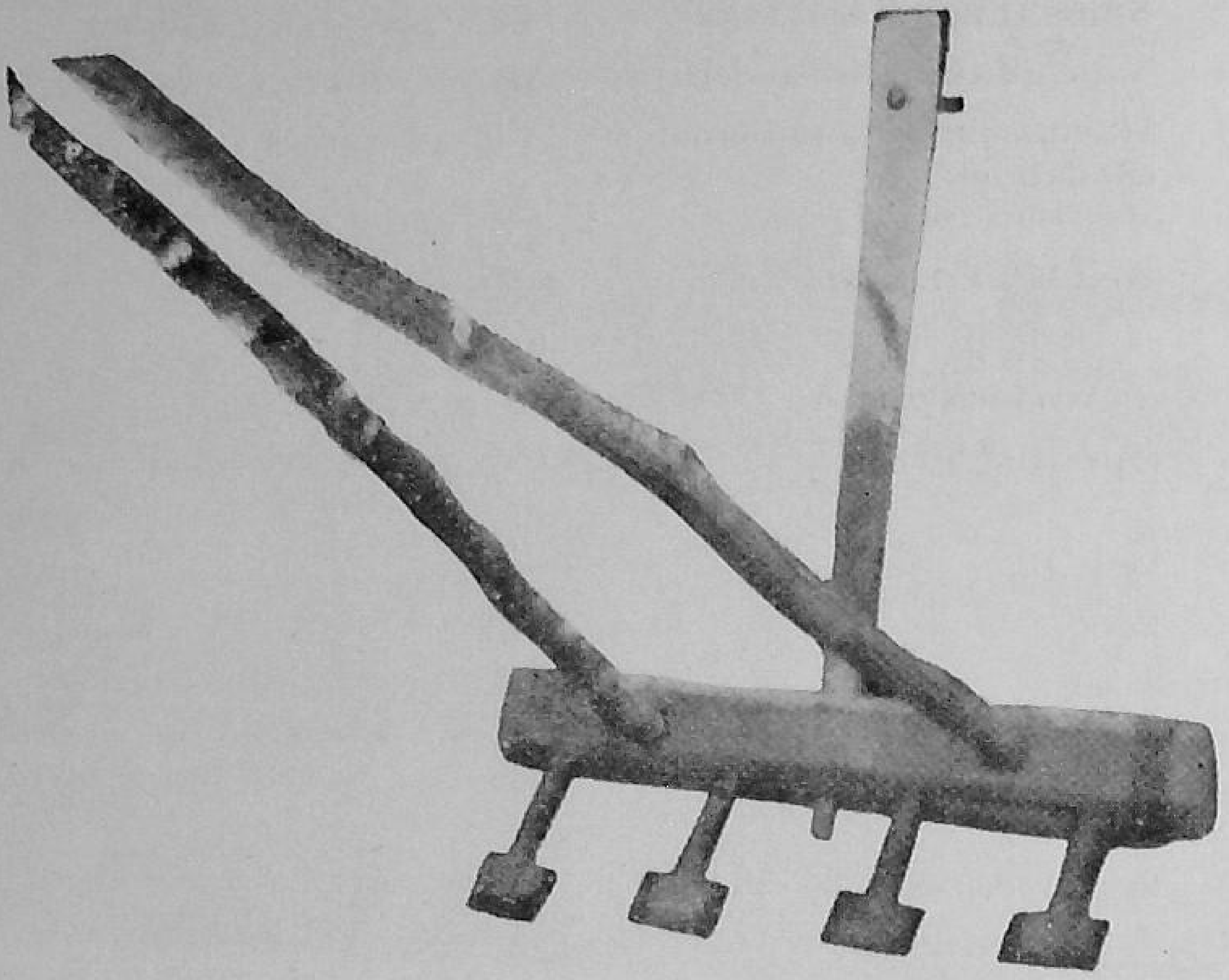
Blade Hoe (Akola) Madhya Pradesh

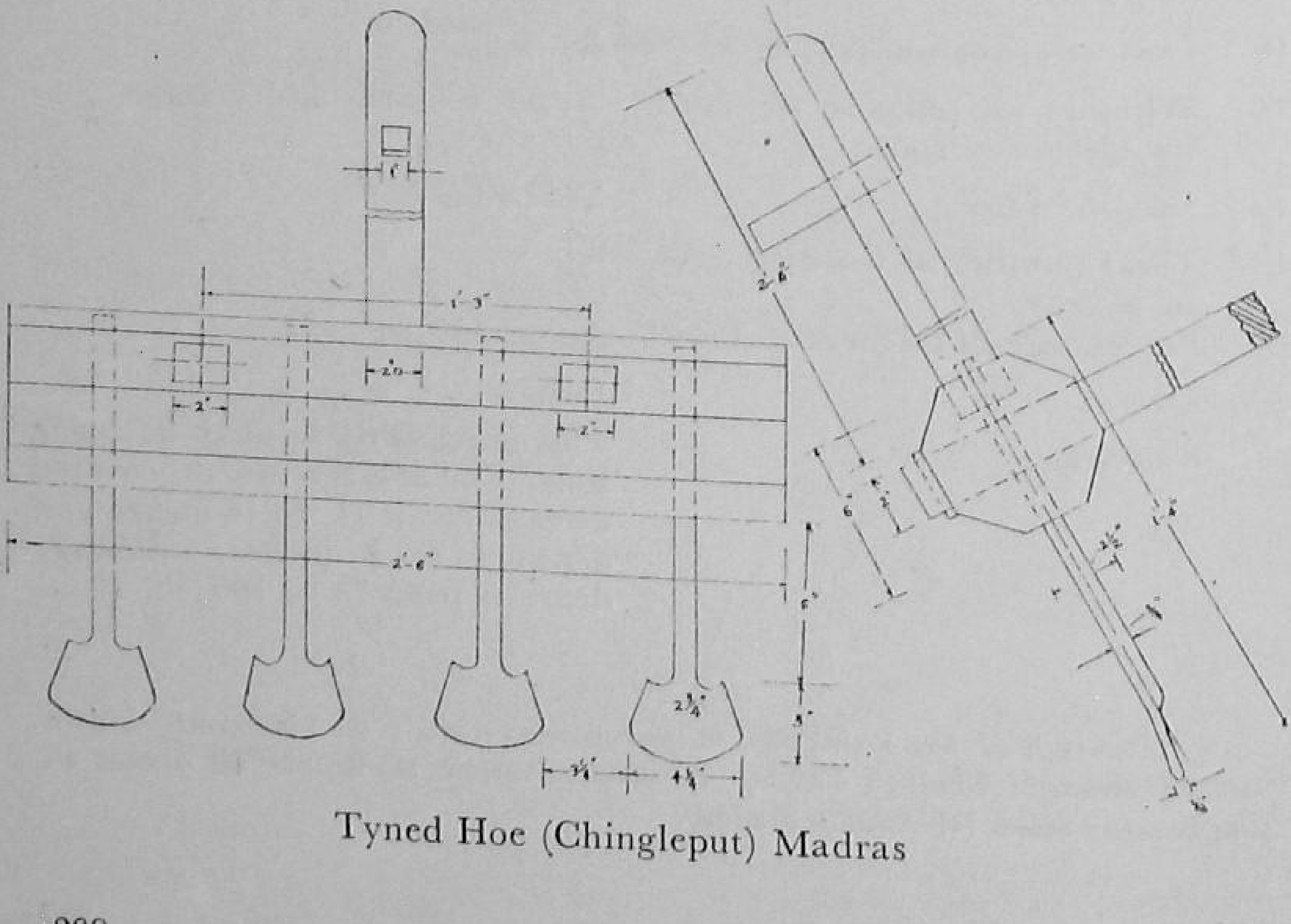
HOES

Blade Hoe—Dora (Madhya Pradesh)

1.	Classification	Interculture implement
2.	Name (English and local)	Blade hoe—Dora, Kolpa
3.	Name of the State and District	Madhya Pradesh—Akola, Nagpur *
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Iron and wood
6.	Weight of the implement	28 to 35 lb.
	(i) Iron part	6 lb.
	(ii) Wooden part	22 to 29 lb.
7.	Operating power	One pair of bullocks and one man for each implement
8.	Cost	Rs. 6
9.	Service life	About 4 years
10.	Usage	Used for interculture operations
11.	Method of application	A pair of hoes is hitched to a common yoke by means of ropes and beam
12.	Repaired locally or othrewise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	3 to 4 acres per day
15.	Cost of operation per acre	Rs. 1.25
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	This implement is used in black soils. The average width covered at each cut is 11 to 16 inches and depth 1 to 2 inches. Average draft is from 75 to 100 lb.

* This type of hoe is also used in the following tracts : (1) Mandsour, Indore Nimar Districts of Madhya Bharat. (2) Sehore District of Bhopal (3) Almost all over Bombay State (4) Andhra Pradesh.



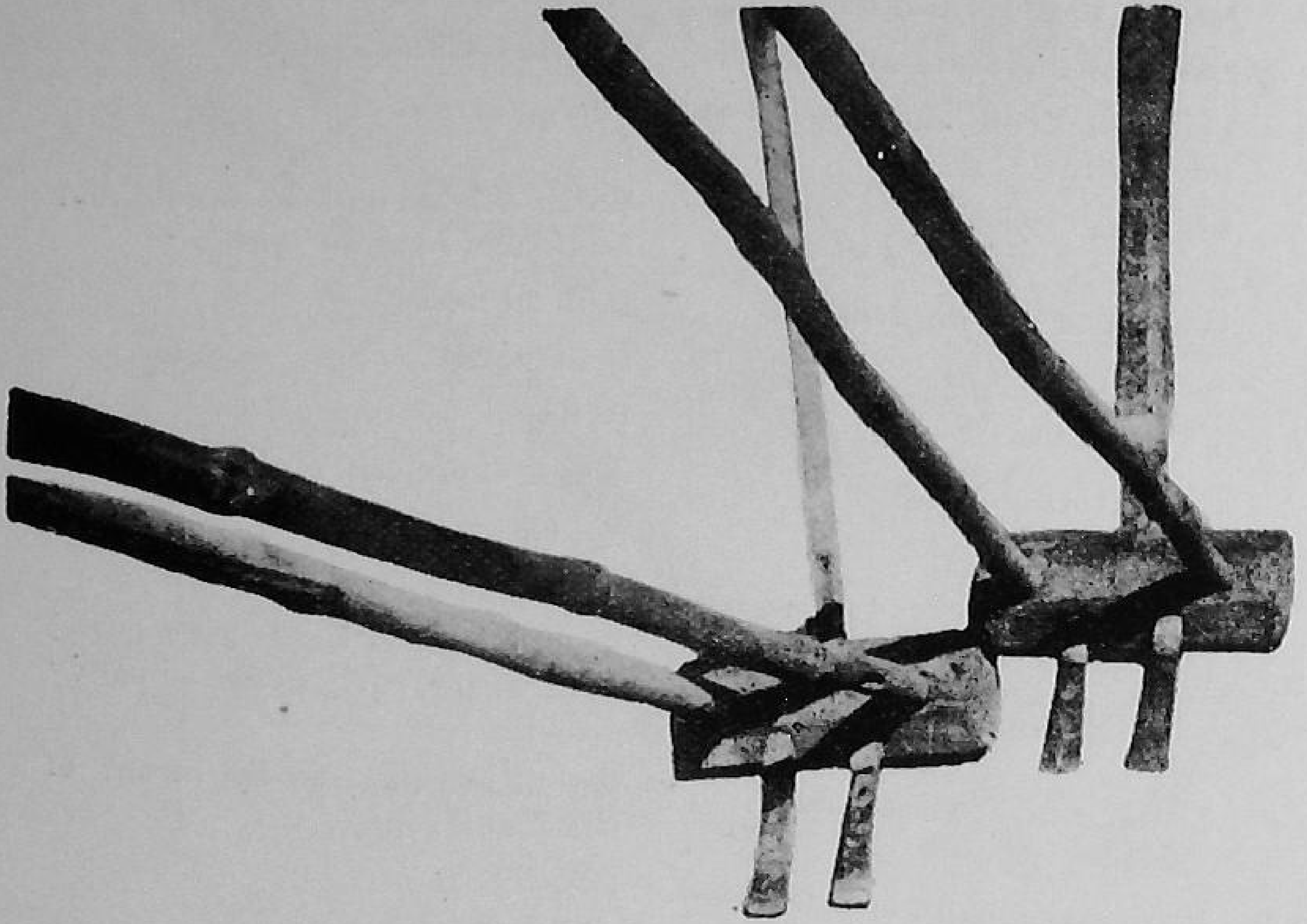


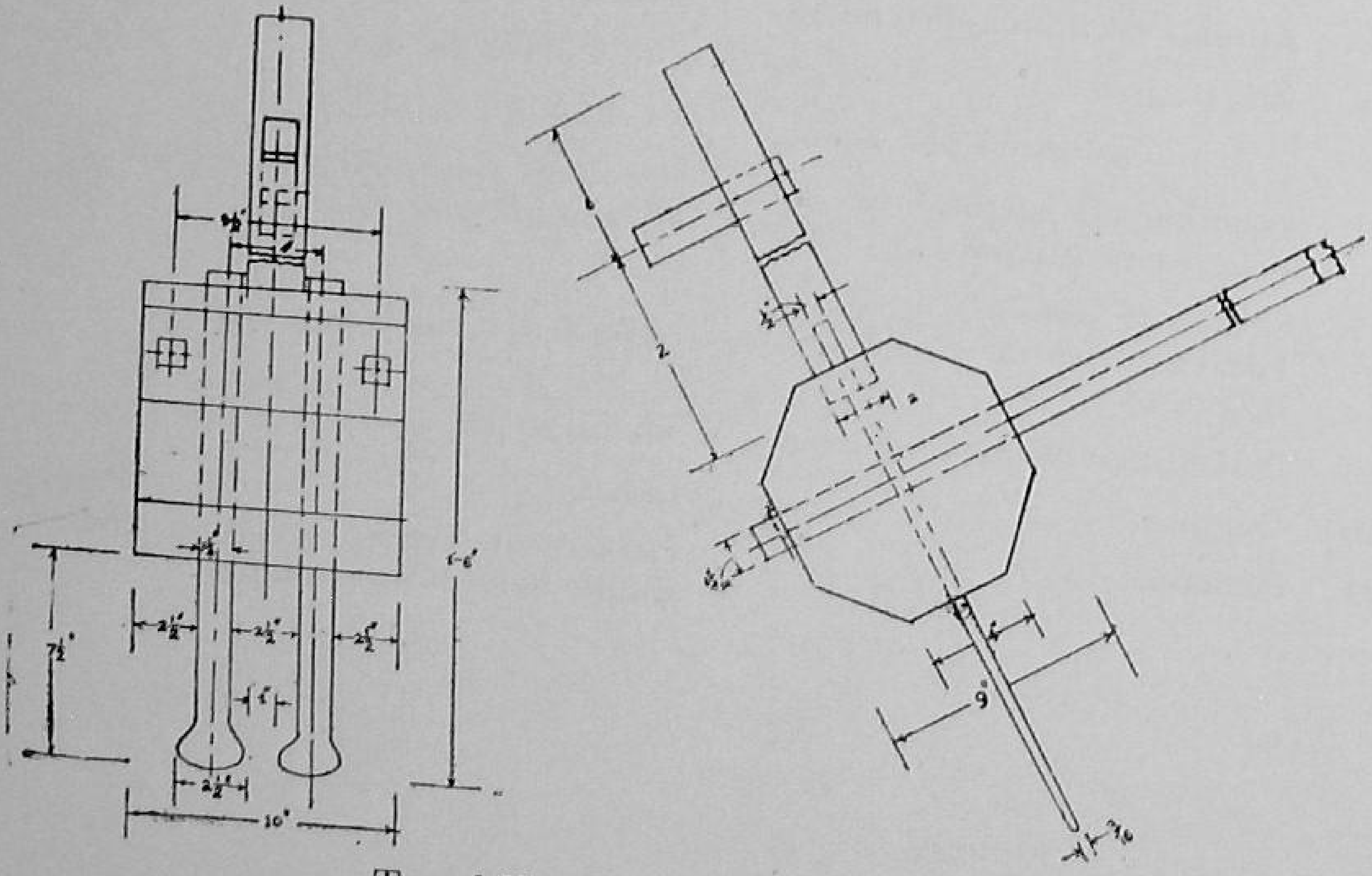
Tyned Hoe (Chingleput) Madras

HOES

Tyned Hoe—Papattam (Madras)

1.	Classification	Interculture implement
2.	Name (English and local)	Tyned hoe—Papattam
3.	Name of the State and District	Madras—Chingleput
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Wood for beam and handle and mild steel bars for tynes
6.	Weight of the implement	25 to 30 lb.
	(i) Iron part	15 to 20 lb.
	(ii) Wooden part	10 lb.
7.	Operating power	A pair of bullocks and a man
8.	Cost	Rs. 15
9.	Service life	4 to 6 years
10.	Usage	For removal of weeds after initial rains in the early stages of paddy growth
11.	Method of application	Hitched to the yoke by means of beam and rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	About Rs. 1.50
14.	Work rate	2 to 3 acres per day
15.	Cost of operation per acre	Rs. 1.50 to 2.00
16.	Whether all purpose or used for specific purpose	Used only in semi-dry paddy areas after light showers
17.	Season of use	—
18.	Total number of working days in a year	Used 2 to 3 times in a year
19.	Percentage of farmers using it	About 20 per cent
20.	Origin	Indian
21.	Remarks	Implement tynes resemble the simple hand hoes in shape.



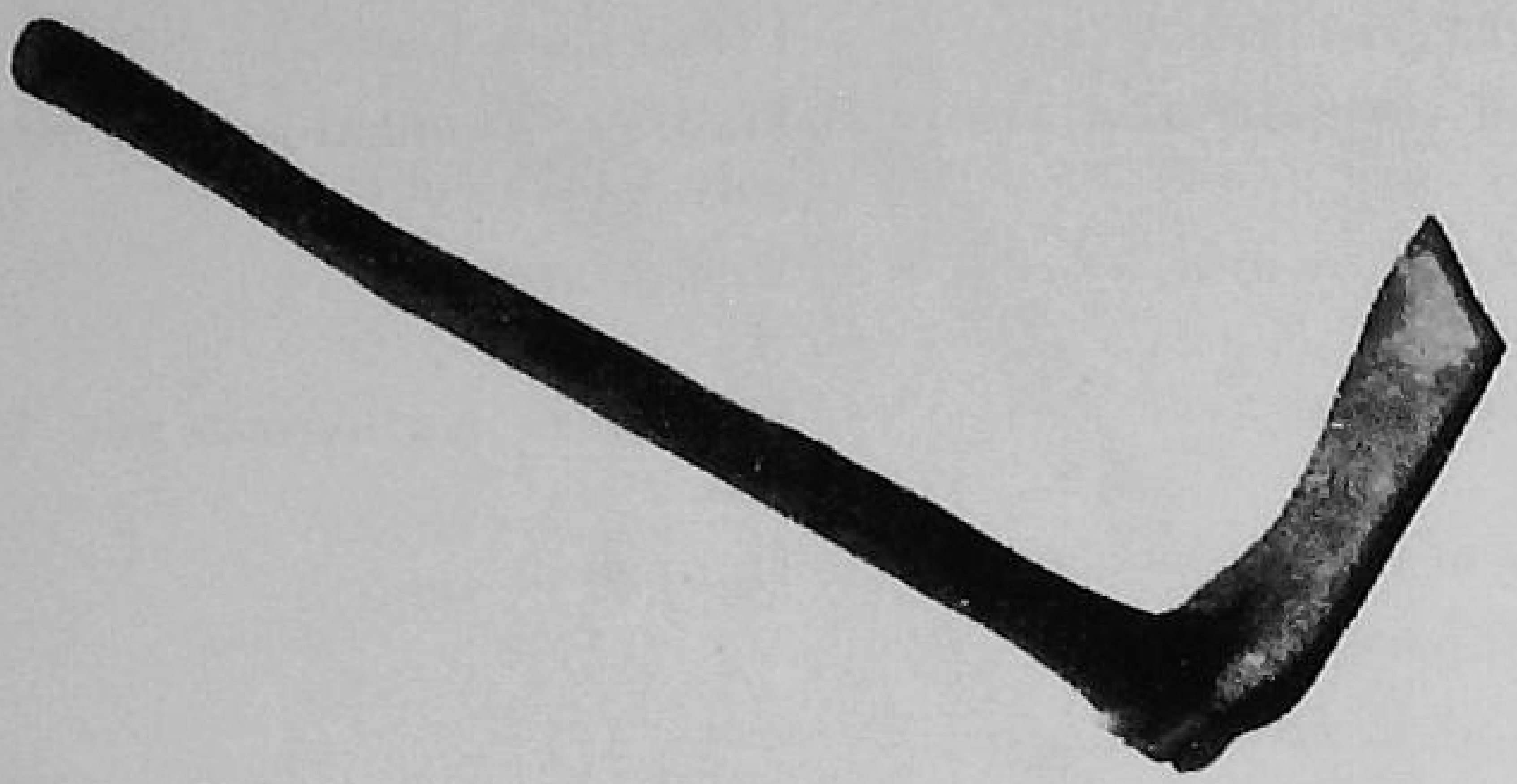


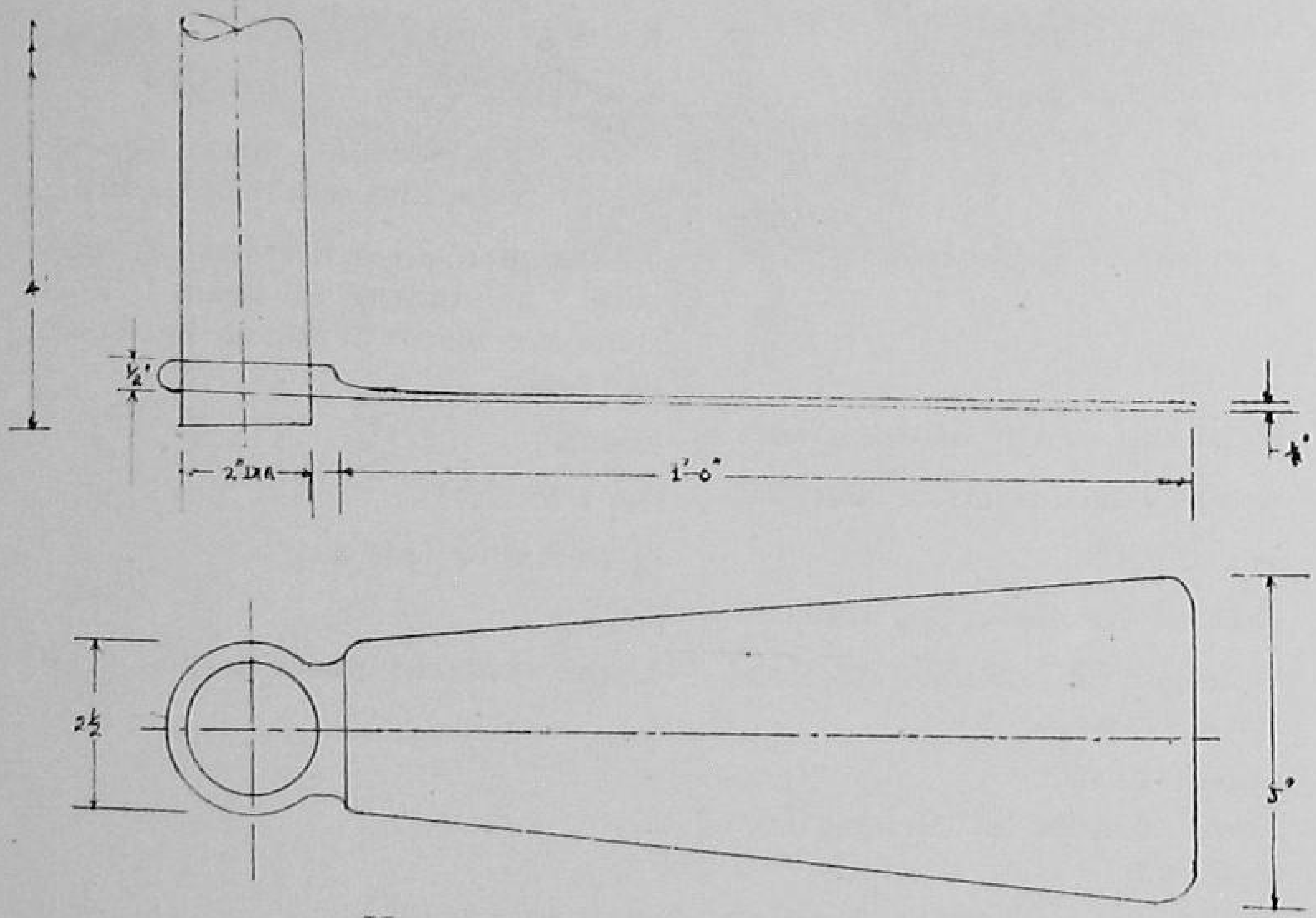
Tyned Hoe (Coimbatore)Madras

HOES

Tyned Hoe—Gunti (Madras)

1. Classification	Interculture implement
2. Name (English and local)	Tyned hoe – Gunti
3. Name of the State and District	Madras—Coimbatore, Trichinopoly, Chingleput
4. Manufacturers and source of availability	Village artisans
5. Materials used	Mild steel, Karuvelam and bamboo
6. Weight of the implement	15 to 20 lb.
(i) Iron part	—
(ii) Wooden part	—
7. Operating power	Two bullocks and two men
8. Cost	Rs. 5 to 10
9. Service life	6 to 8 years
10. Usage	Used for weeding and hoeing ragi, *Cholam* and semi-dry paddy
11. Method of application	The implement is hitched to the yoke by means of beam. The tynes are made to run in between the rows
12. Repaired locally or otherwise	Locally
13. Annual maintenance charges	Rs. 1 to 1.50
14. Work rate	1½ to 2 acres per day
15. Cost of operation per acre	Rs. 2
16. Whether all purpose or used for specific purpose	As per remarks under usage
17. Season of use	—
18. Total number of working days in a year	—
19. Percentage of farmers using it	60 to 70 per cent
20. Origin	Indian
21. Remarks	This implement is used in red soils. The average width covered at each cut is 3 inches and depth 3 inches. This type is also found in practice in North Coorg.



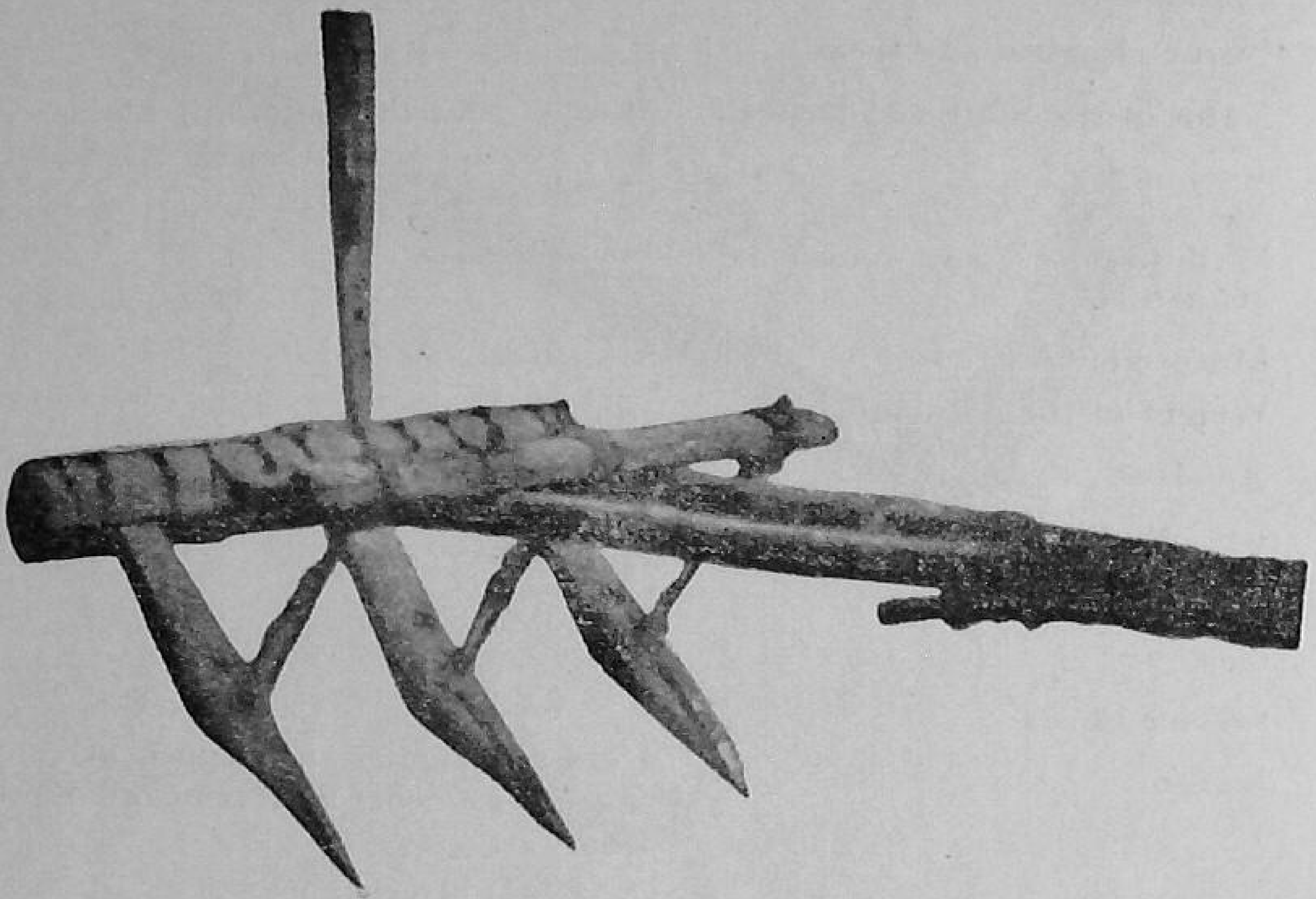


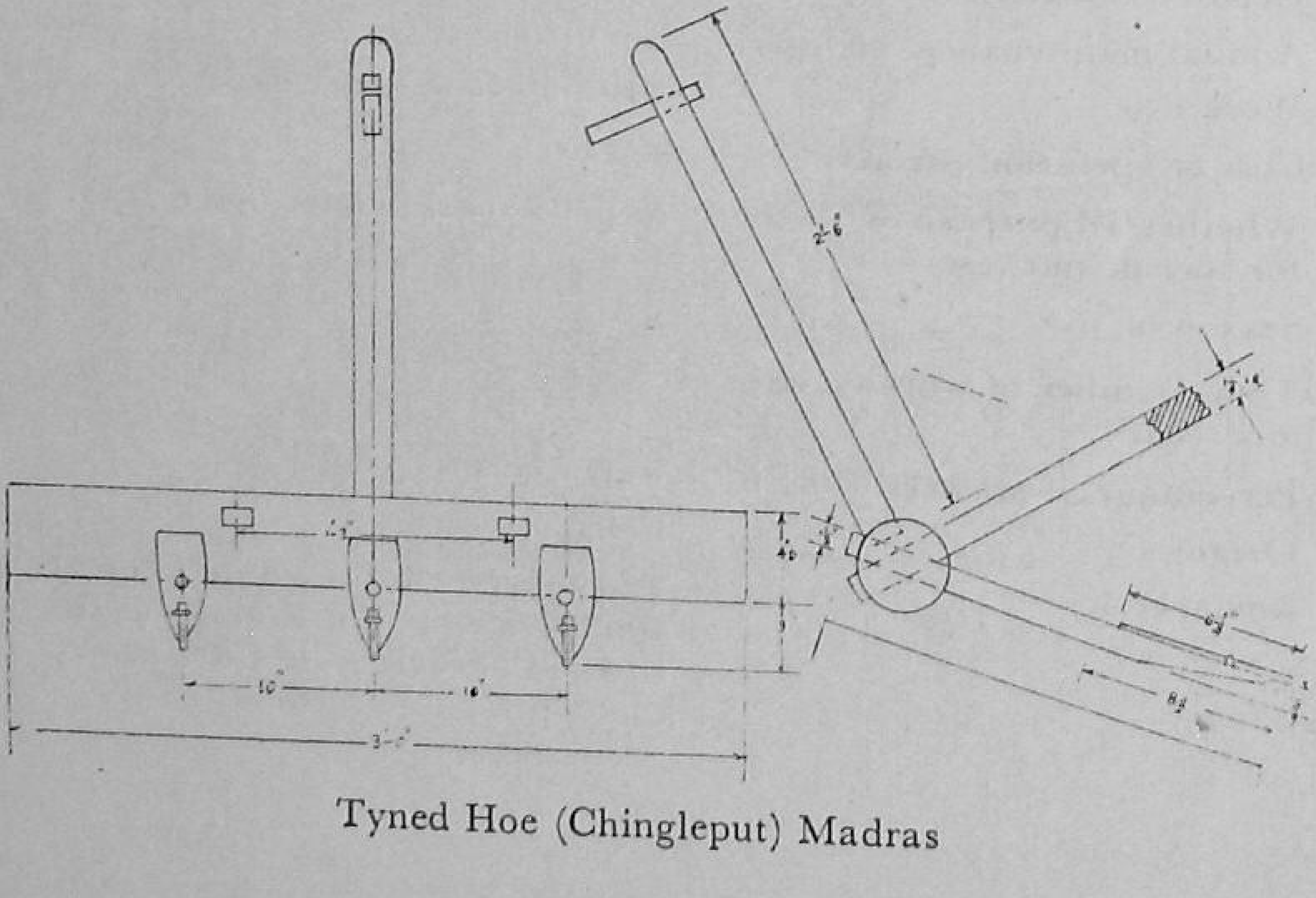
Hand Hoe (South Malabar) Madras

HOES

HAND HOE—KALAIKOTHI (MADRAS)

1.	Classification	Interculture implement
2.	Name (English and local)	Hand Hoe—Kalaikothi
3.	Name of the State and District	Madras—North and South Malabar, South Arcot, North Arcot, Chingleput
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Mild steel and teak
6.	Weight of the implement	10 lb.
	(i) Iron part	4 lb.
	(ii) Wooden part	6 lb.
7.	Operating power	One man
8.	Cost	Rs. 2
9.	Service life	3 to 4 years
10.	Usage	Used for digging in pepper and coconut gardens, and removal of weeds
11.	Method of application	Operated manually
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.25
14.	Work rate	0.10 to 0.15 acre per day
15.	Cost of operation per acre	Rs. 15
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	70 per cent
20.	Origin	Indian
21.	Remarks	This implement is used in alluvial and black soils. The average width covered at each cut is 4 to 5 inches and depth 2 to 4 inches



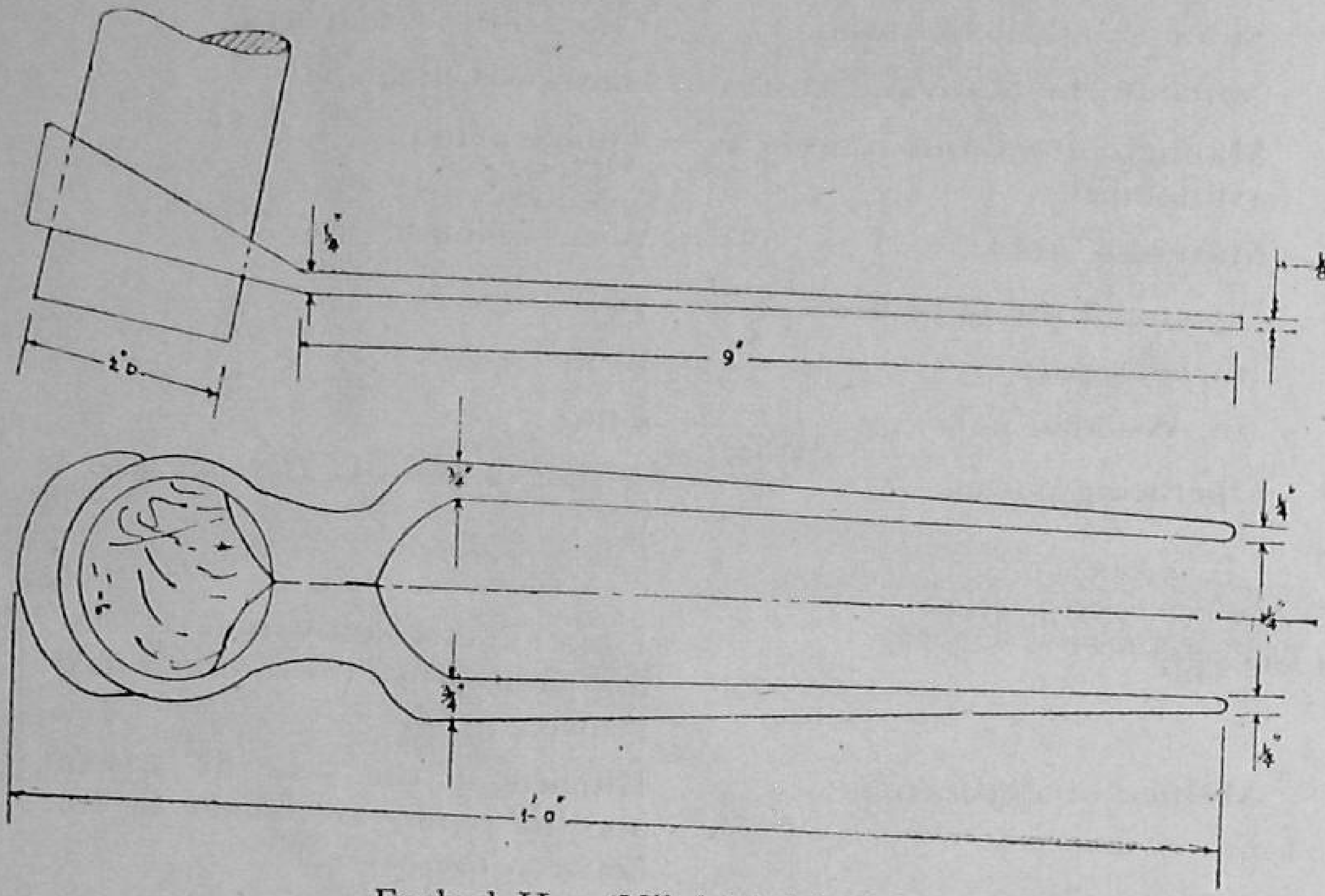


Tyned Hoe (Chingleput) Madras

HOES

Tyned Hoe—Addagorru (Madras)

1.	Classification	Interculture implement
2.	Name (English and local)	Tyned hoe—Addagorru
3.	Name of the State and District	Madras—Chingleput
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Wood and iron
6.	Weight of the implement	18 lb.
	(i) Iron part	10 lb.
	(ii) Wooden part	8 lb.
7.	Operating power	A pair of bullocks and one man
8.	Cost	Rs. 8
9.	Service life	6 to 8 years
10.	Usage	Used for intercultivation in semi-dry paddy when the seedlings have grown
11.	Method of application	Hitched to the yoke by a beam and the tynes are made to run between the rows
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1.50 to 2
14.	Work rate	—
15.	Cost of operation per acre	Rs. 1.50 to 2
16.	Whether all purpose or used for specific purpose	Used in semi-dry paddy cultivation and also for crops like *cholam*
17.	Season of use	--
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 40 per cent
20.	Origin	Indian
21.	Remarks	The tynes are similar to the tynes of the gorru and this could be easily converted into a seed drill by the attachment of the seed bowl and tubes. Hence the tynes are provided with drilled holes



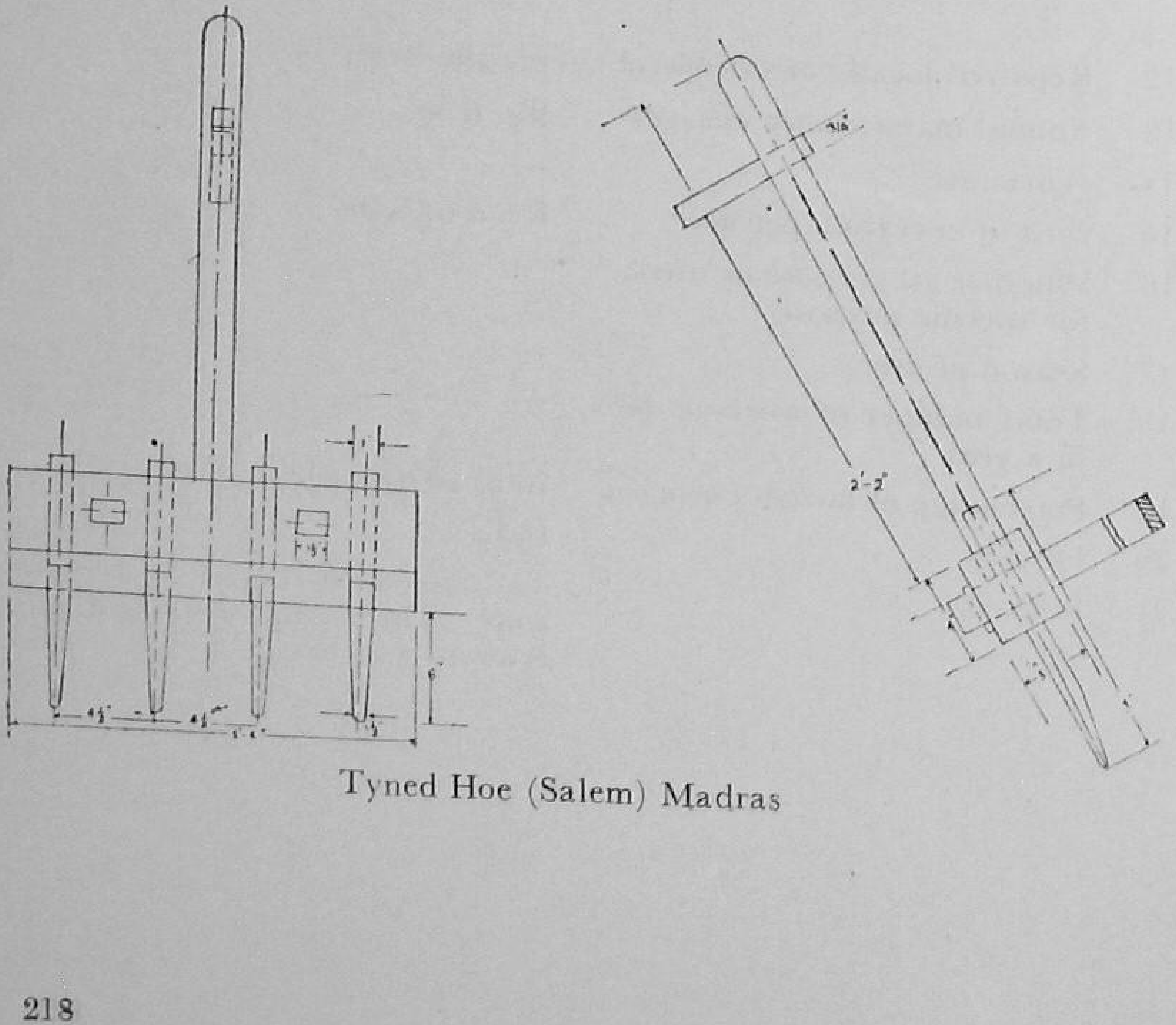
Forked Hoe (Nilgiris) Madras

HOES

Forked Hoe—Guddali (Madras)

1. Classification	Interculture implement
2. Name (English and local)	Forked hoe—Guddali
3. Name of the State and District	Madras—Nilgiris, Madurai
4. Manufacturers and source of availability	Village artisans
5. Materials used	Mild steel and wood
6. Weight of implement	3 lb.
(i) Iron part	2 lb.
(ii) Wooden part	1 lb.
7. Operating power	One man
8. Cost	Rs. 2
9. Service life	2 to 3 years
10. Usage	Used for weeding, cultivating, ridging and harvesting
11. Method of application	Operated manually
12. Repaired locally or otherwise	Locally
13. Annual maintenance charges	Re. 0.50
14. Work rate	—
15. Cost of operation per acre	Rs. 5 to 7.50
16. Whether all purpose or used for specific purpose	—
17. Season of use	—
18. Total number of working days in a year	—
19. Percentage of farmers using it	70 to 80 per cent
20. Origin	Indian
21. Remarks	The implement is used in laterite soils. The average working depth is about 4 inches

PLATE 78

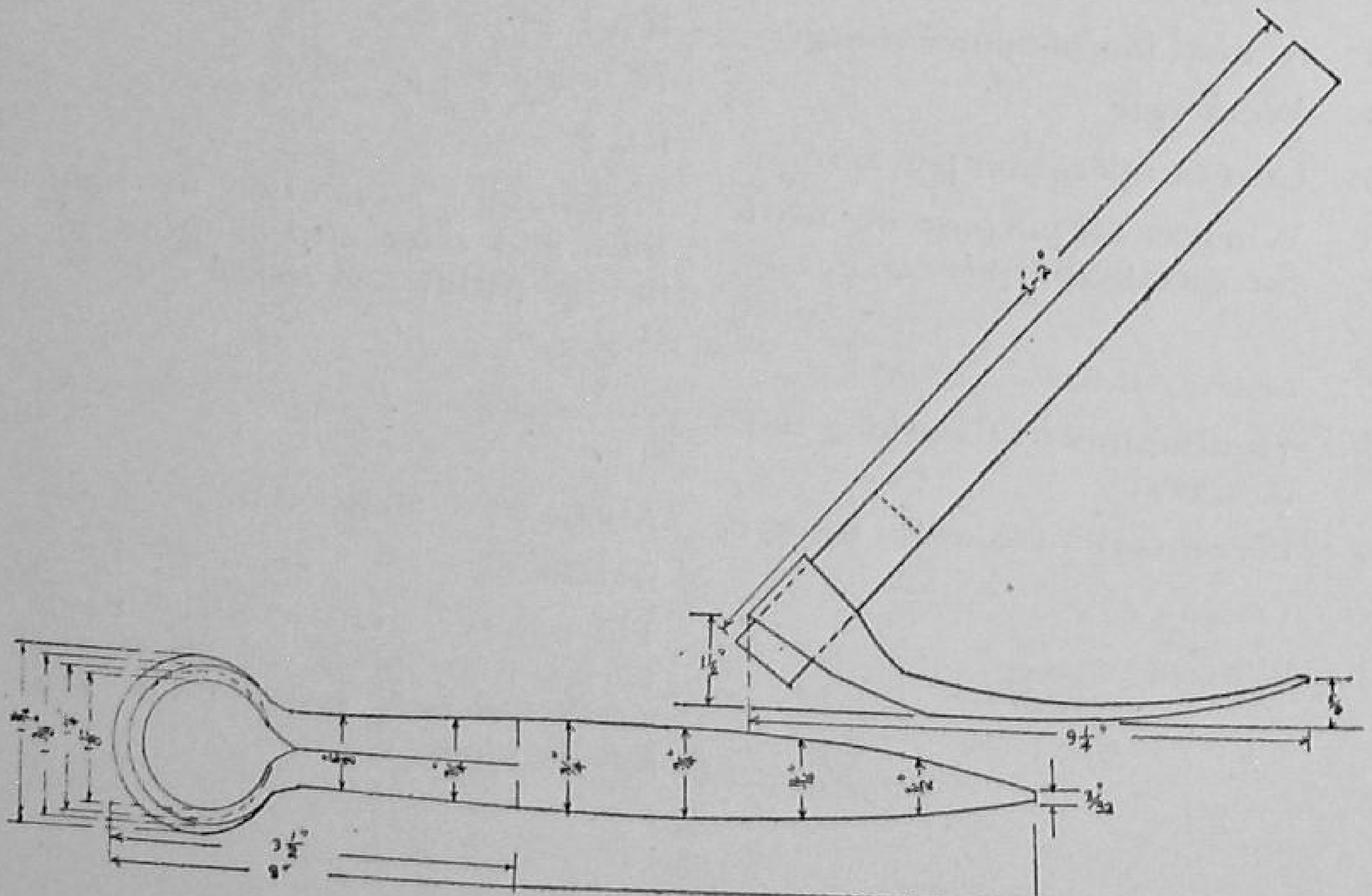


Tyned Hoe (Salem) Madras

HOES

Tyned Hoe—Eguntae, Thadi Gunti (Madras)

1.	Classification	Interculture implement
2.	Name (English and local)	Tyned hoe – Eguntae, Thadi Gunti
3.	Name of the State and District	Madras – Salem, Coimbatore, Chingleput
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Beam of wood and tynes of mild steel bars
6.	Weight of the implement	20 to 30 lb.
	(i) Iron part	10 to 15 lb.
	(ii) Wooden part	10 to 15 lb.
7.	Operating power	A pair of bullocks and one man
8.	Cost	Rs. 7 to 8
9.	Service life	6 to 8 years
10.	Usage	Used for initial tillage and for intercultivation between rows
11.	Method of application	Hitched to the yoke by a beam
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1.50 to 2
14.	Work rate	1½ to 2 acres per day
15.	Cost of operation per acre	Rs. 2
16	Whether all purpose or used for specific purpose	Preparatory cultivation in light soils and intercultural operations in *ragi*, paddy and *cholam*
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 40 to 60 per cent
20.	Origin	Indian
21.	Remarks	The number and size of the tynes varies from place to place. In Salem District, this type of hoe has six tynes.



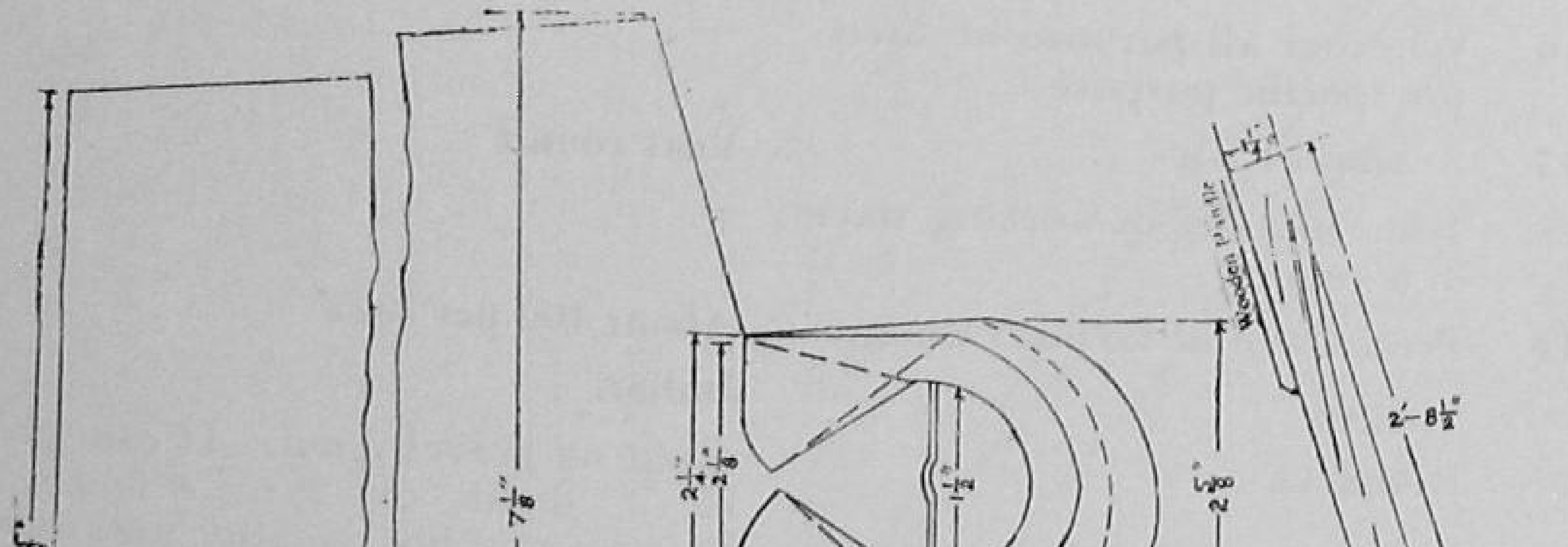
Pick (Dehra Dun) Uttar Pradesh

HOES

Pick—Kudal (Uttar Pradesh)

1. Classification	Interculture implement
2. Name (English and local)	Pick—Kudal
3. Name of the State and District	Uttar Pradesh—Dehra Dun
4. Manufacturers and source of availability	Village artisans
5. Materials used	Wood and mild steel
6. Weight of the implement	2 lb.
(i) Iron part	—
(ii) Wooden part	—
7. Operating power	One man
8. Cost	Re. 1
9. Service life	3 years
10. Usage	Used for hoeing
11. Method of application	Worked by a man holding the implement in the right hand while sitting
12. Repaired locally or otherwise	Locally
13. Annual maintenance charges	Re. 0.75
14. Work rate	0.16 acre per day
15. Cost of operation per acre	Rs. 10 to 12
16. Whether all purpose or used for specific purpose	—
17. Season of use	Year round
18. Total number of working days in a year	—
19. Percentage of farmers using it	About 100 per cent
20. Origin	Indian
21. Remarks	Used on gravelly soil. It can go to a depth of 2 to 4 inches. This type of hoe is also used in Coimbatore and Trichy Districts of Madras State

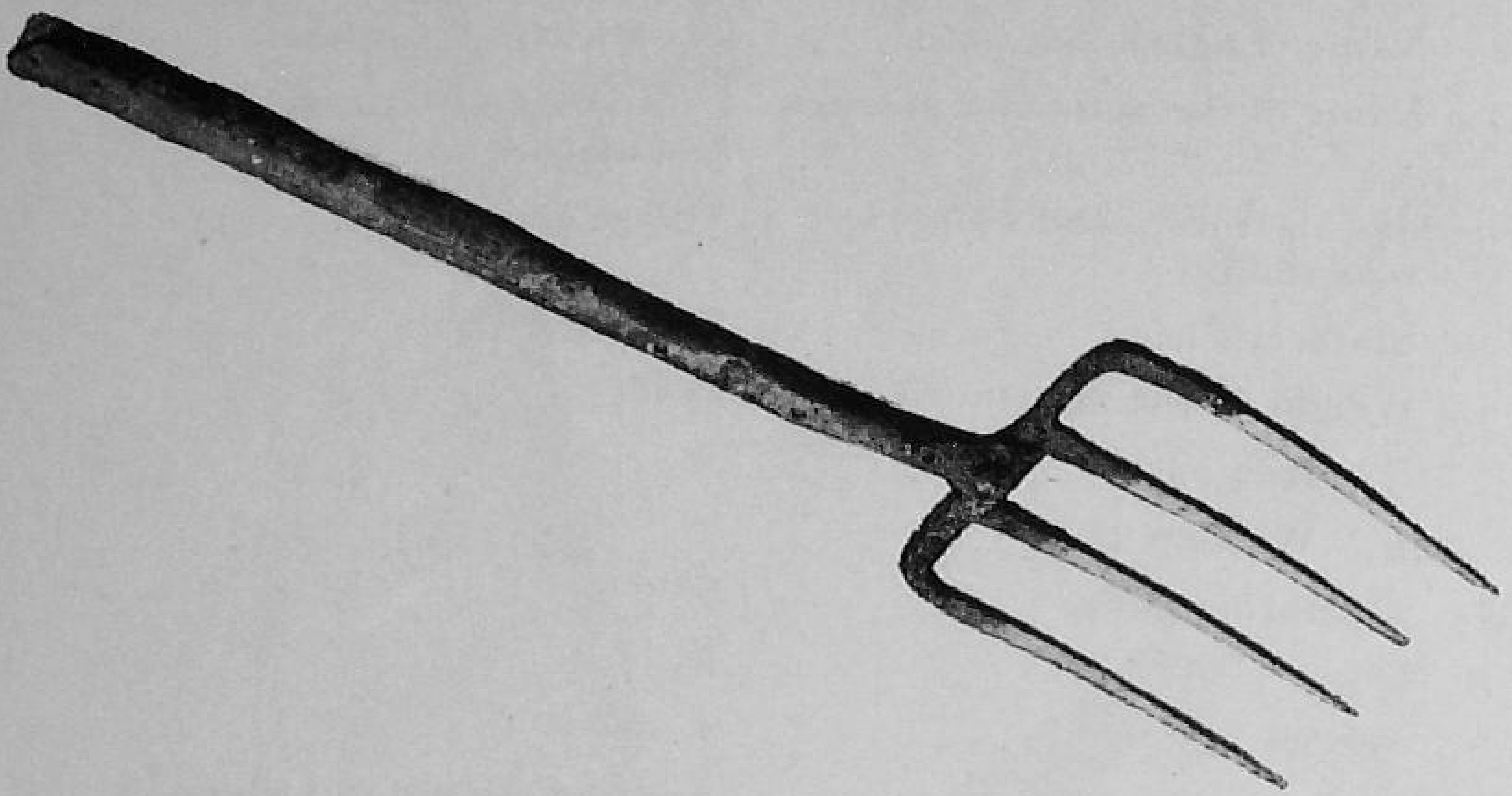
PLATE 80

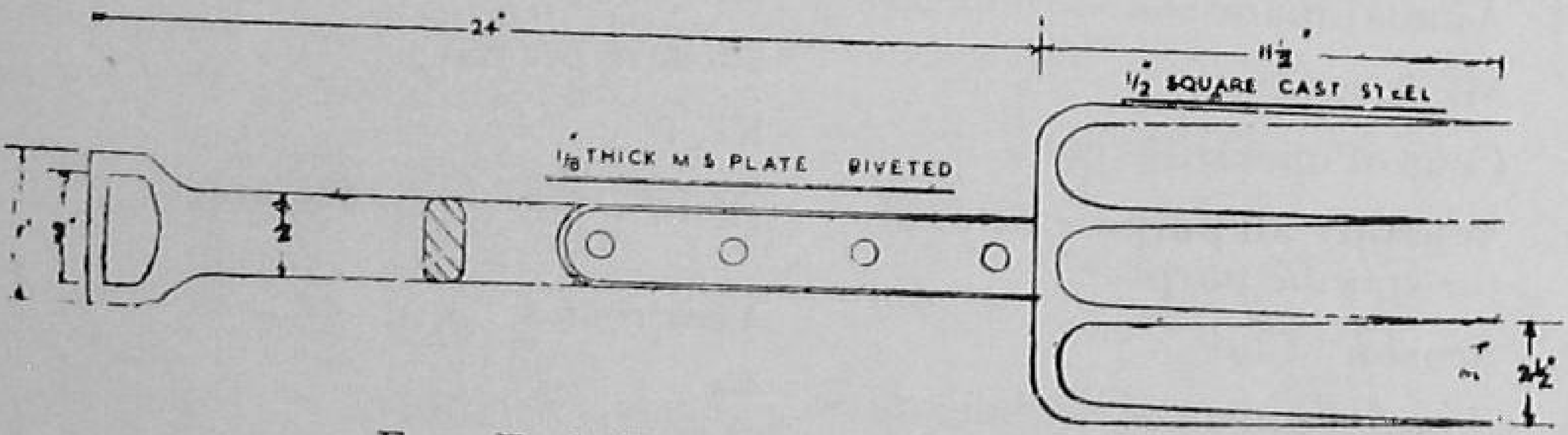


Pick (Gorakhpur) Uttar Pradesh

ssification	Interculture implement
me (English and local)	Pick—Kassi or Gorhni
me of the State and District	Uttar Pradesh—Gorakhpur, Moradabad, and Banda
nufacturers and source of ilability	Village artisans
terials used	Wood and steel
ight of the implement	$5\frac{1}{2}$ lb.
Iron part	—
Wooden part	—
erating power	One man
t	Rs. 3.50
vice life	4 years
ge	Used for hoeing and tilling the so
thod of application	Worked manually by holding th implement by hands in standin position
paired locally or otherwise	Locally
ual maintenance charges	Re. 0.50
k rate	1/6 acre per day
of operation per acre	Rs. 9
ether all purpose or used pecific purpose	As per remarks under usage
son of use	Year round
al number of working days year	—
entage of farmers using it	About 40 per cent
gin	Indian
arks	The implement is used in alluvial soils. It works to a depth of $2\frac{1}{2}$ to 5 inches and width of 4 inches at each cut.

PLATE 81



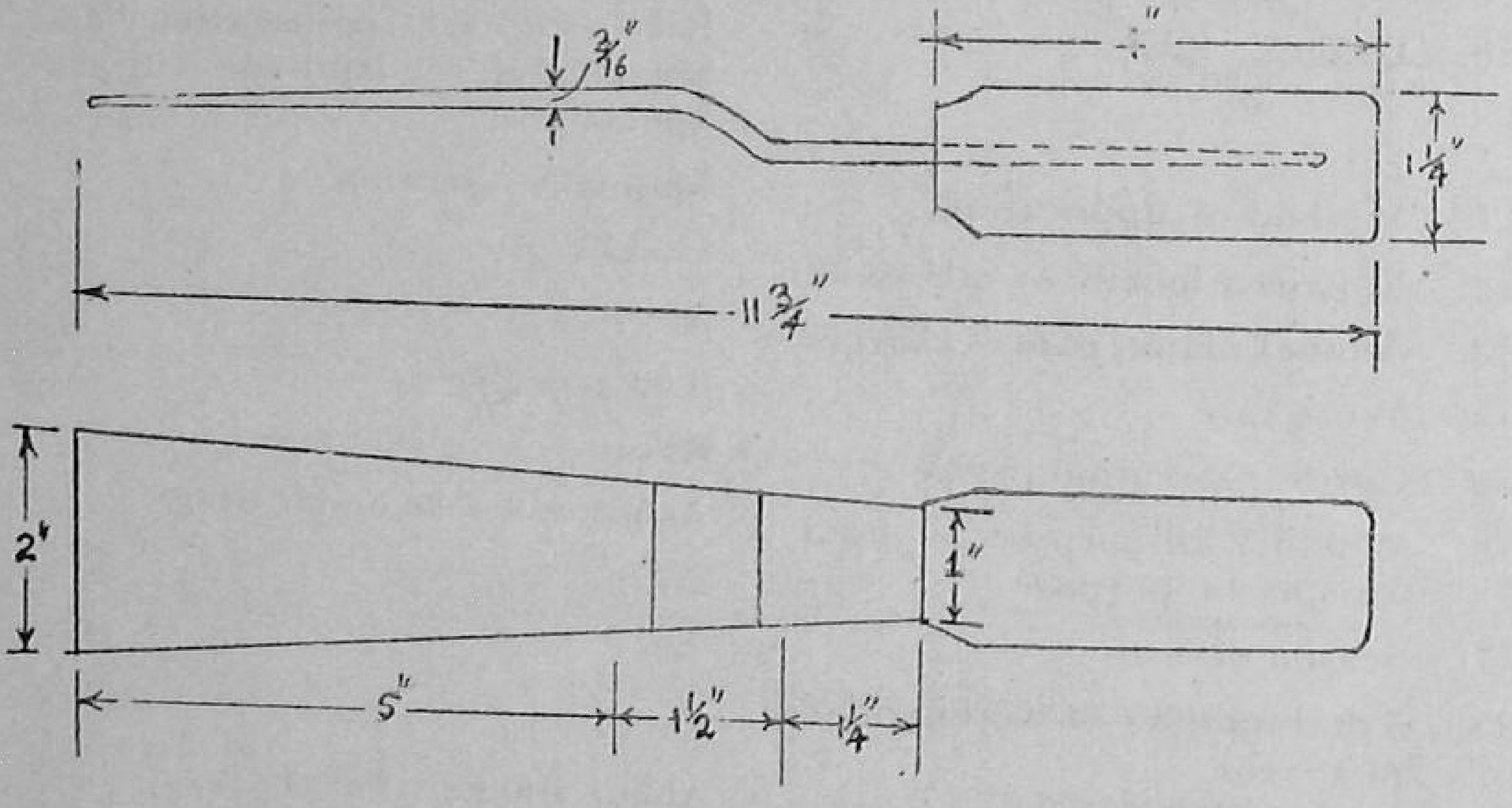


Foot Fork (Darjeeling) West Bengal

HOES

Foot Fork—Lutta Kuta (West Bengal)

1.	Classification	Digging implement
2.	Name (English and local)	Foot fork—Lutta Kuta
3.	Name of the State and District	West Bengal—Darjeeling, Howrah
4.	Manufacturers and source of availability	Manufactured at Calcutta by Tata Agrico Implements
5.	Materials used	Cast steel, teak and Sal wood
6.	Weight of the implement	5½ lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One man
8.	Cost	Rs. 12
9.	Service life	2 years
10.	Usage	For seed bed preparation and breaking up the land and cultural operations
11.	Method of application	Manually operated
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 1
14.	Work rate	0.02 acre per day
15.	Cost of operation per acre	Rs. 10
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	This implement is used in gravelly and laterite soils. Average width covered at each cut is 9 inches and depth covered is 6 inches.



Hand Hoe—West Bengal

HOES

Hand Hoe—Nirani or Khurpi (West Bengal)

1.	Classification	Interculture implement
2.	Name (English and local)	Hand hoe—Nirani or Khurpi
3.	Name of the State and District	West Bengal
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Blade of mild steel and handle of wood
6.	Weight of the implement	$\frac{3}{4}$ to 1 lb.
	(i) Iron part	$\frac{1}{2}$ to $\frac{3}{4}$ lb.
	(ii) Wooden part	$\frac{1}{4}$ lb.
7.	Operating power	One man
8.	Cost	Re. 0.75 to Re. 1.00
9.	Service life	2 years
10.	Usage	For removing weeds and loosening the soil
11.	Method of application	Implement is held by the handle and is operated by a man in a sitting position. It is pushed into the soil to dig the roots of weeds
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Practically nil
14.	Work rate	0.12 to 0.25 acre per day
15.	Cost of operation per acre	Rs. 6 to 13
16.	Whether all purpose or used for specific purpose	Implement intended mainly for weeding and interculture of paddy and jute crops
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	As this tool is worked in a sitting position, the output is very low

SECTION V

SEED DRILLS AND SOWING DEVICES IN USE IN DIFFERENT STATES

SEED DRILLS

The practice of drilling seeds is fairly widespread throughout India except in Assam and some portions of West Bengal, Bihar, Kerala and the Konkan coast. Transplanted paddy is perhaps the only crop where drilling is not practised.

The design of all seed drills is basically the same although several regional variants have been reported. No seed drill from Rajasthan, West Bengal, Assam, Orissa, Bihar and Travancore-Cochin has been reported.

The simplest seed drill consists of a vertical tube with a seed bowl and is fitted with a shoe piece and a wearing point at the lower end. This arrangement is tied by a thin rope and is dragged behind the country plough. The operator holds the tube vertically in the furrow and drops the seeds into the seed bowl as the drill is dragged behind the plough. The country plough is often adopted to line sowing by attaching the seeding tube directly to the body or to a hole drilled in the shoe piece of the plough.

Seed drills meant for sowing simultaneously more than one row are common in the Central and Southern States. The most widely used type is basically a bullock-drawn hoe or harrow having two to twelve tynes, each carrying a seed tube attached to a common seed bowl. The two-tyned and three-tyned seed drills are most popular and are called Duphan and Triphan respectively.

One important variation of Duphan is a six feet spaced double tyned seed drill (DRG-50) used for row sowing of cotton in Gujerat. This requires two persons to drop the seeds.

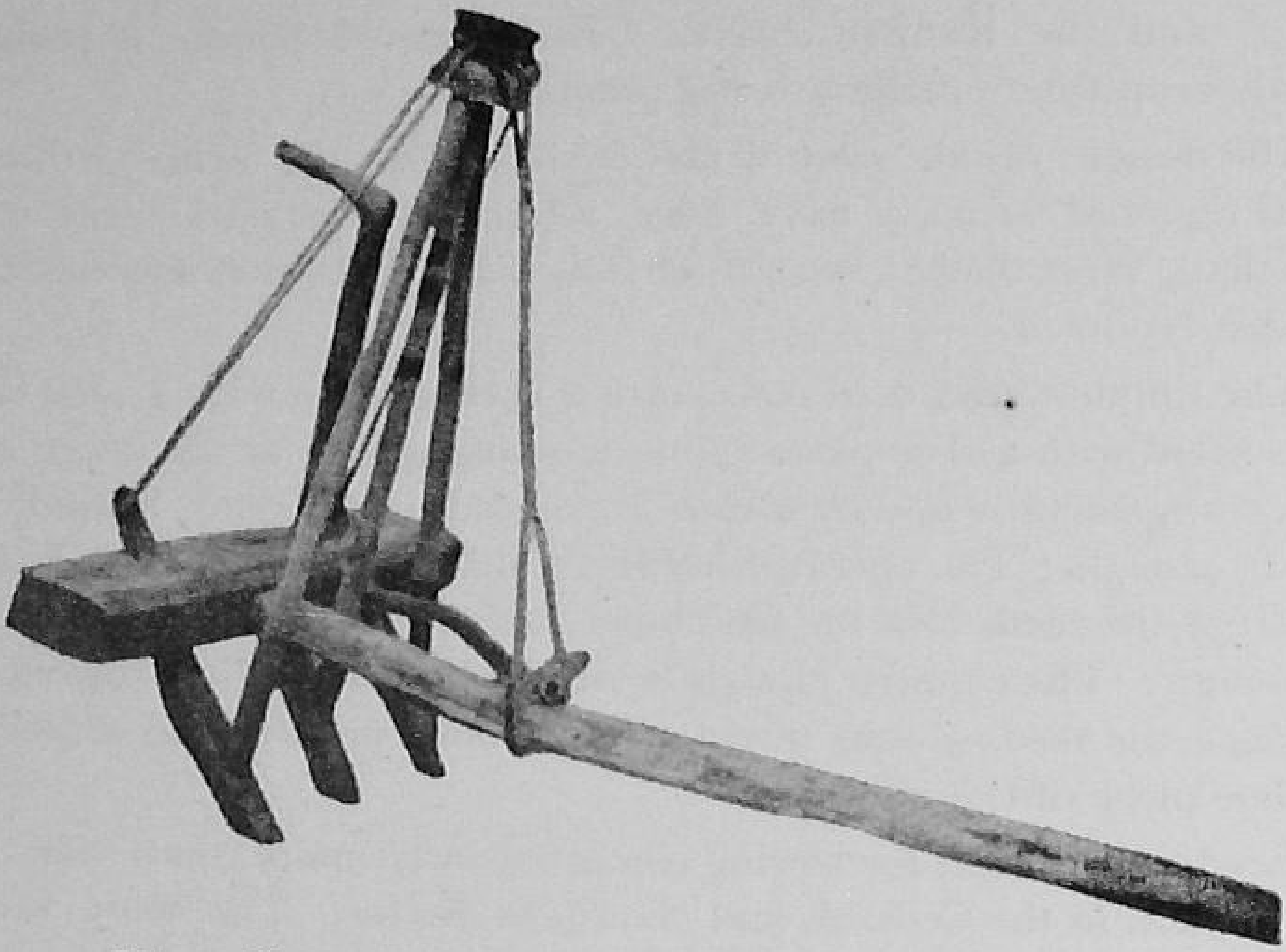
An interesting type of seed bowl, having a cone shaped projection in the centre, for the purpose of splitting the seed stream dropped is reported from Mysore. This enables uniform distribution of the seeds in the tubes located radially around the cone.

A seed drill having an unusually heavy construction and draft has been reportəd in use from Bombay which requires two pairs of bullocks to operate it. The reason for this seems to be that the seeds have to be dropped at 4 inches to 5 inches depths in heavy soils in order to reach the moisture line.

To maintain the spacings between successive runs with a multi-tyned seed drill, the bullocks are hitched suitably along the yoke.

An interesting type of sugarcane planter has been reported from Gujerat. (DRG-49).

Detailed description of various kinds of drills used in various parts of India has been given in the following pages.



Three-Tyned Seed Drill (Raichur) Andhra Pradesh

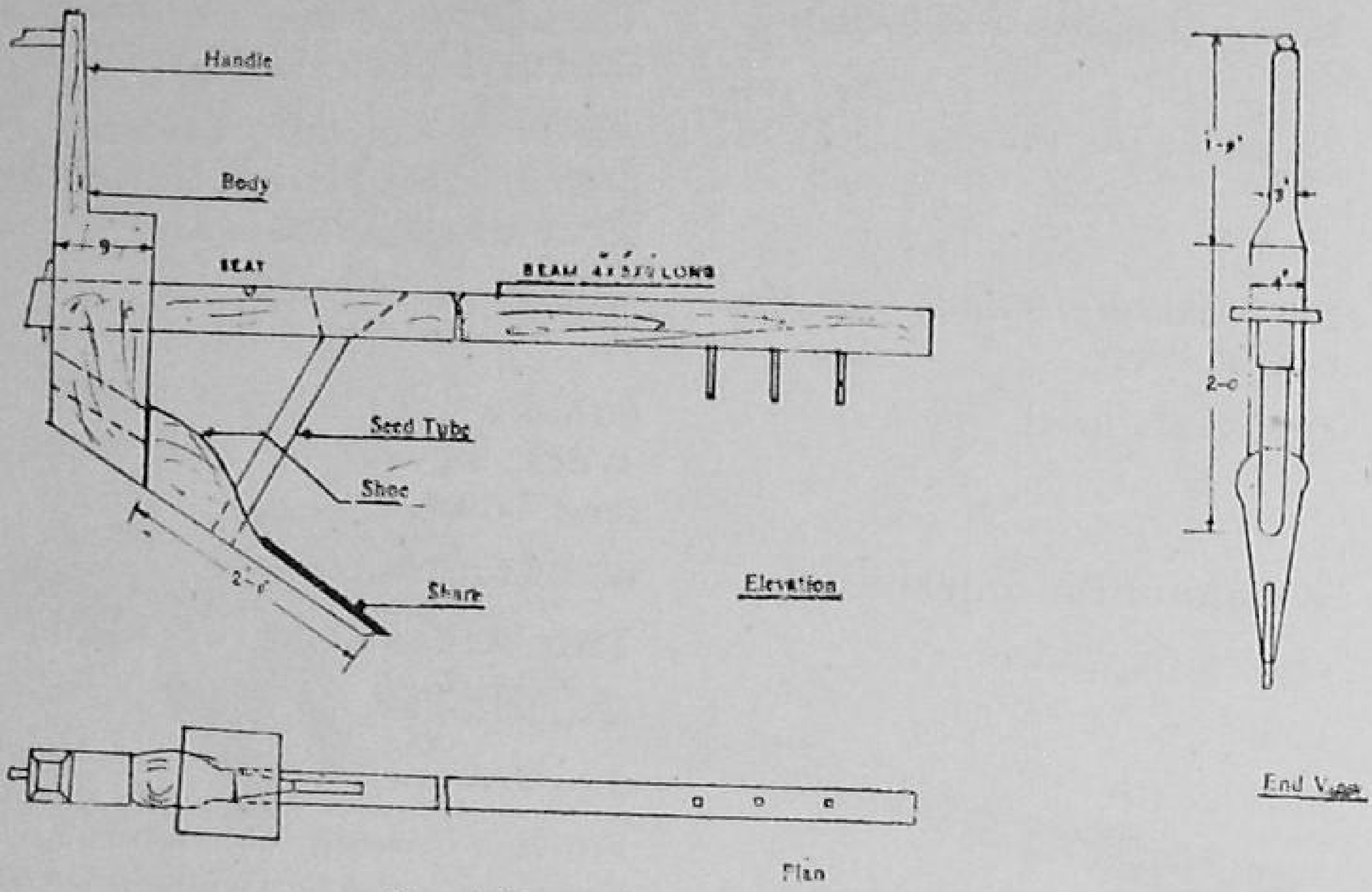
SEED DRILLS

Three-Tyned Seed Drill—Vithul Gorru (Andhra Pradesh)

1.	Classification	Sowing implement
2.	Name (English and local)	Three-tyned seed drill—Vithul Gorru, Tiphen, Kurigay
3.	Name of the State and District	Andhra—Raichur, Adilabad, Parbhani, Diger, Medak, Karimnagar, Hyderabad, Warangal *
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Babul wood for beam, handle and tynes, Sagwan or teak wood for seed bowl
6.	Weight of the implement	60 to 120 lb.
7.	Operating power	Two bullocks and two men
8.	Cost	Rs. 20 to 30
9.	Service life	2 to 3 years
10.	Usage	For line sowing of various crops like *jowar*, *mung*, groundnut, *bajra*, cotton etc.
11	Method of application	The seed drill is hitched to the yoke by means of a beam. One man drives the bullock and other drops the seeds in the centre of the bowl
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance	Rs. 4 to 5
14.	Work rate	—
15.	Cost of operation per acre	Rs. 2 to 4.50
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	—

*This type of drill is also found in practice in the following areas: Nimar, Akola, Nagpur, Wardha of Madhya Pradesh; Mehsana, Sabar Kantha, Belgaum, Bijapur, Kolhapur, West Khandesh, Nasik, Ahemdnagar, Jalgaon, Ahemdabad, Poona, Baroda, Dharwar, of Bombay State; Gulbarga, Osmanabad, Aurangabad Districts of Hyderabad State,

PLATE 84

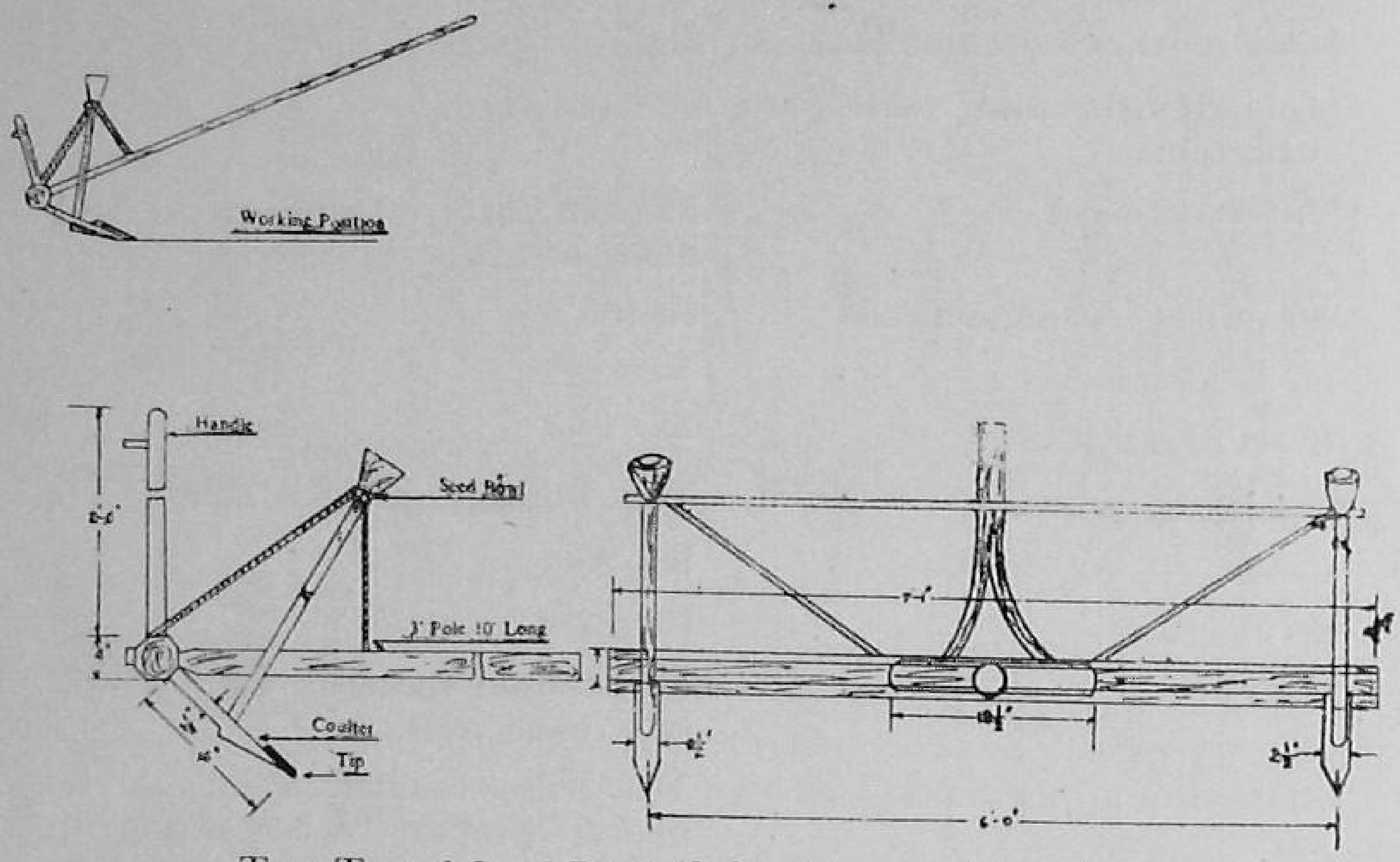


Seed Drill (Surat) Bombay

SEED DRILLS

Seed Drill (Bombay)

1.	Classification	Sowing implement
2.	Name (English and local)	Seed drill
3.	Name of the State and District	Bombay—Surat
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Babul, teak, bamboo wood and mild steel bars
6.	Weight of the implement	48 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and two men
8.	Cost	Rs. 20
9.	Service life	10 years
10.	Usage	This is used specially for planting sugarcane setts.
11.	Method of application	The drill is hitched to the yoke by means of ropes. A boy sitting on the seat feeds sugarcane setts through a specially prepared seed bowl
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 3
14.	Work rate	—
15.	Cost of operation per acre	—
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Planting season of sugarcane
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	Almost 100 per cent in Surat Distt.
20.	Origin	Indian
21.	Remarks	It is a single row drill. The average depth of sowing of sugarcane setts is about 3 inches.

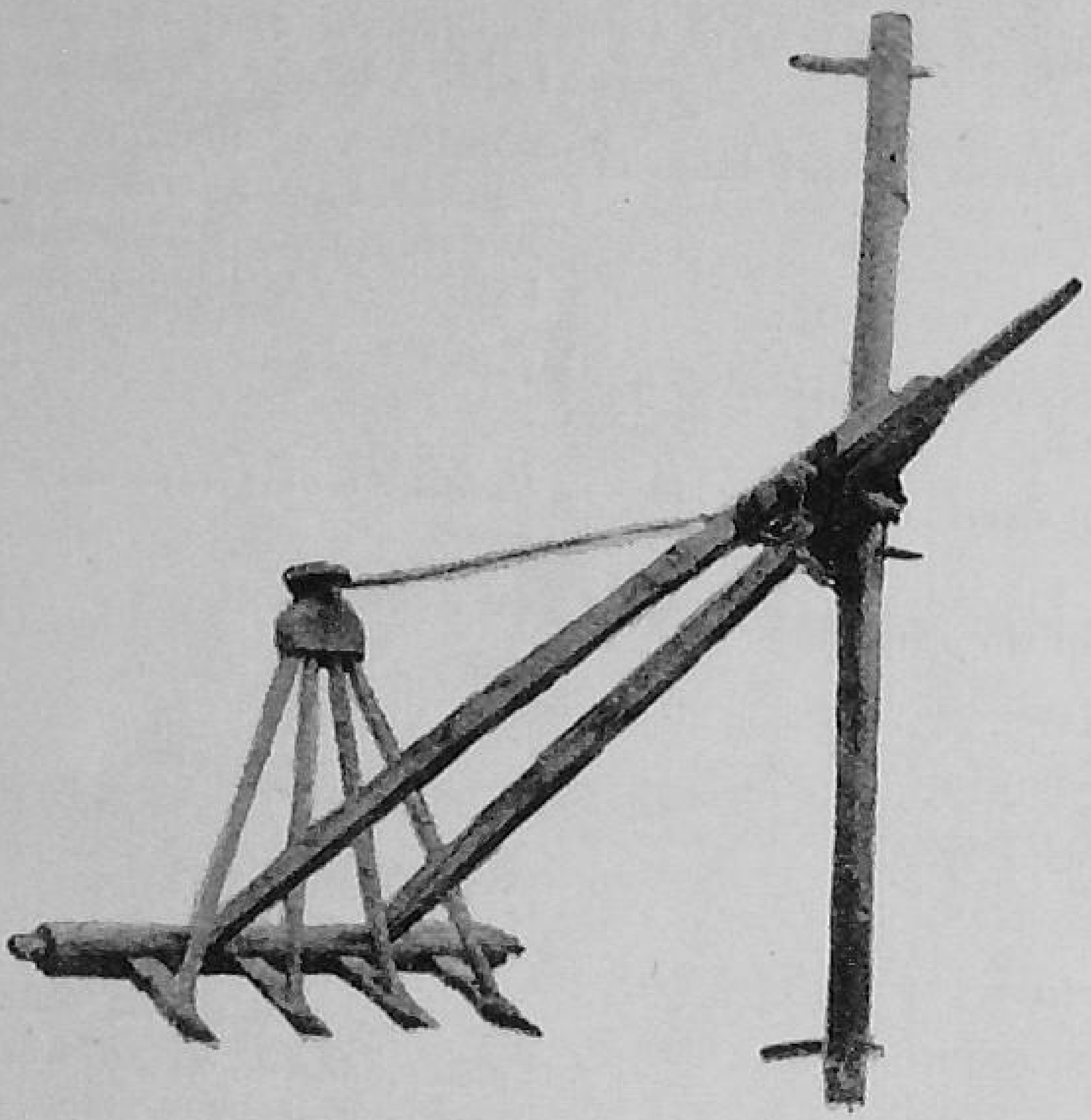


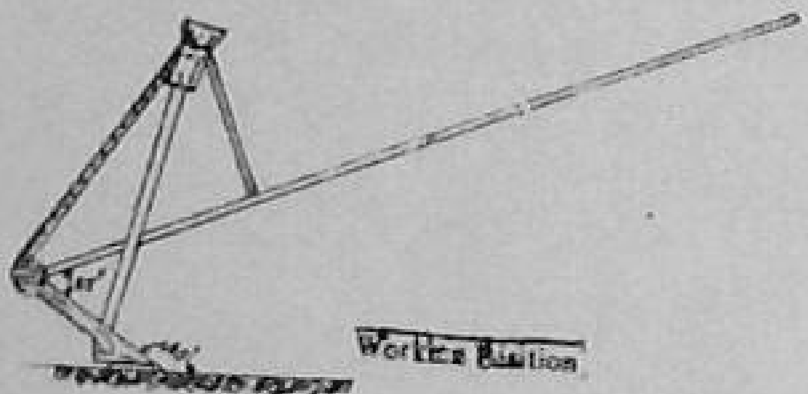
Two-Tyned Seed Drill (Sabar Kantha) Bombay

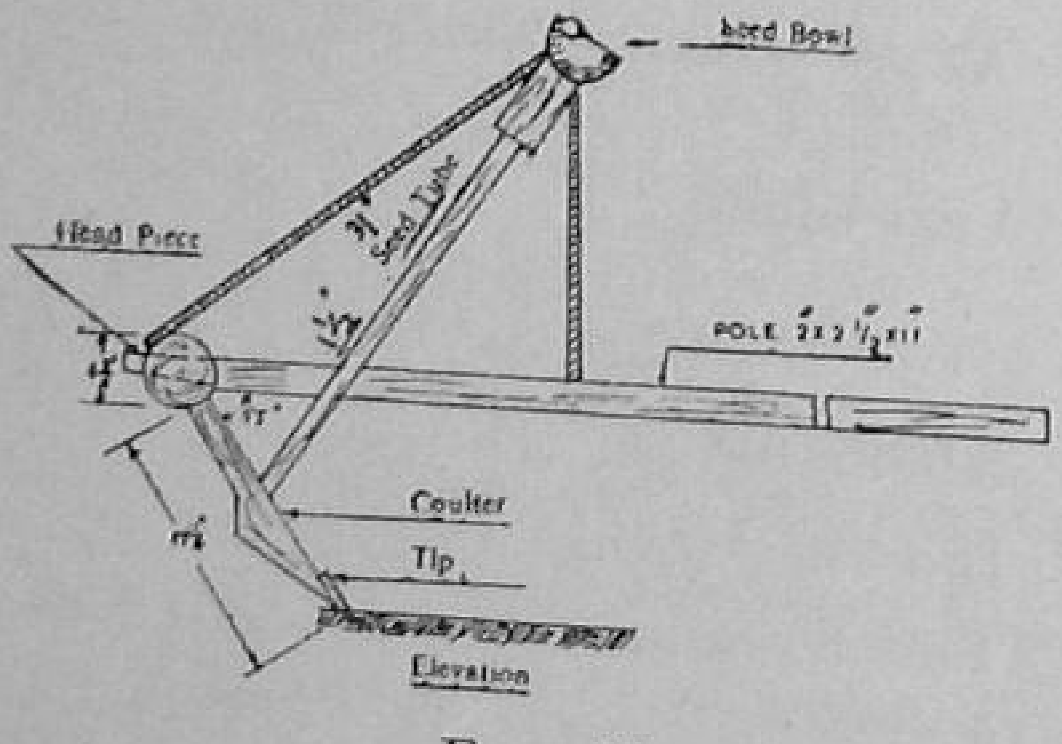
SEED DRILLS

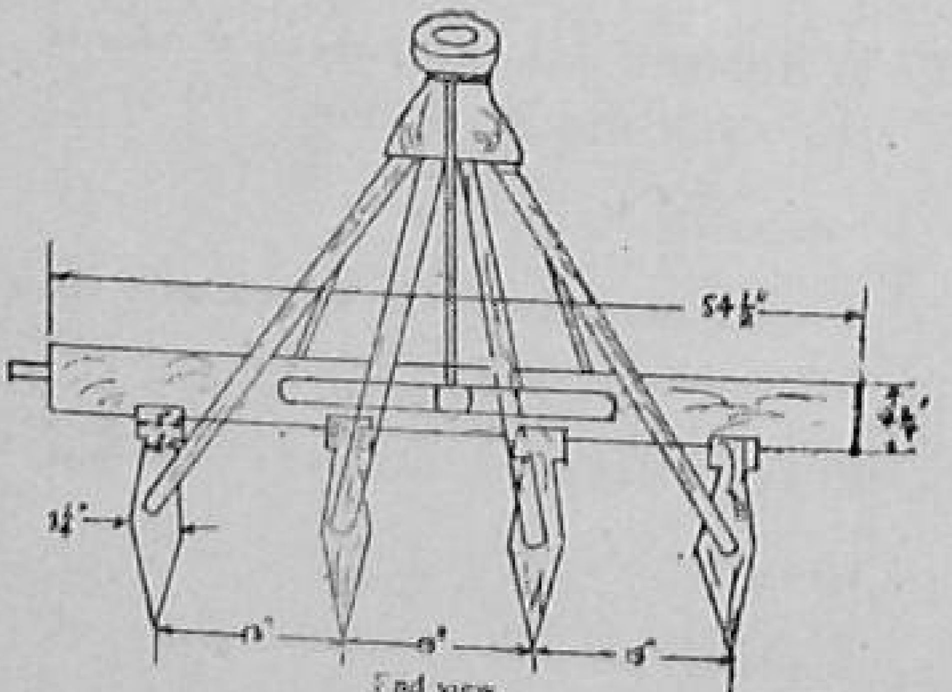
Two-Tyned Drill—Moghada, Faidko, Kurgi, Dhuphan (Bombay)

1.	Classification	Sowing implement
2.	Name (English and local)	Two-tyned drill- Moghada, Faidko, Kurgi, Dhuphan.
3.	Name of the State and District	Bombay — Broach, Dharwar, Ahmedabad, East Khandesh, Sabar Kantha, Panchmahal, Parbhani
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Babul, teak, bamboo, and mild steel
6.	Weight of the implement	40 to 70 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	—
8.	Cost	Rs. 15 to 25
9.	Service life	5 to 10 years
10.	Usage	For line sowing of wheat, gram, *jowar, bajra*, groundnut, maize, and cotton
11.	Method of application	The beam is tied to the yoke with ropes. The depth of sowing is adjusted by adjusting the hitching distance
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1 to 2
14.	Work rate	2 to 4 acres per day
15.	Cost of operation per acre	Rs. 2 to 5
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	The depth of sowing is about 2 to 5 inches. This drill is specially used for sowing cotton.









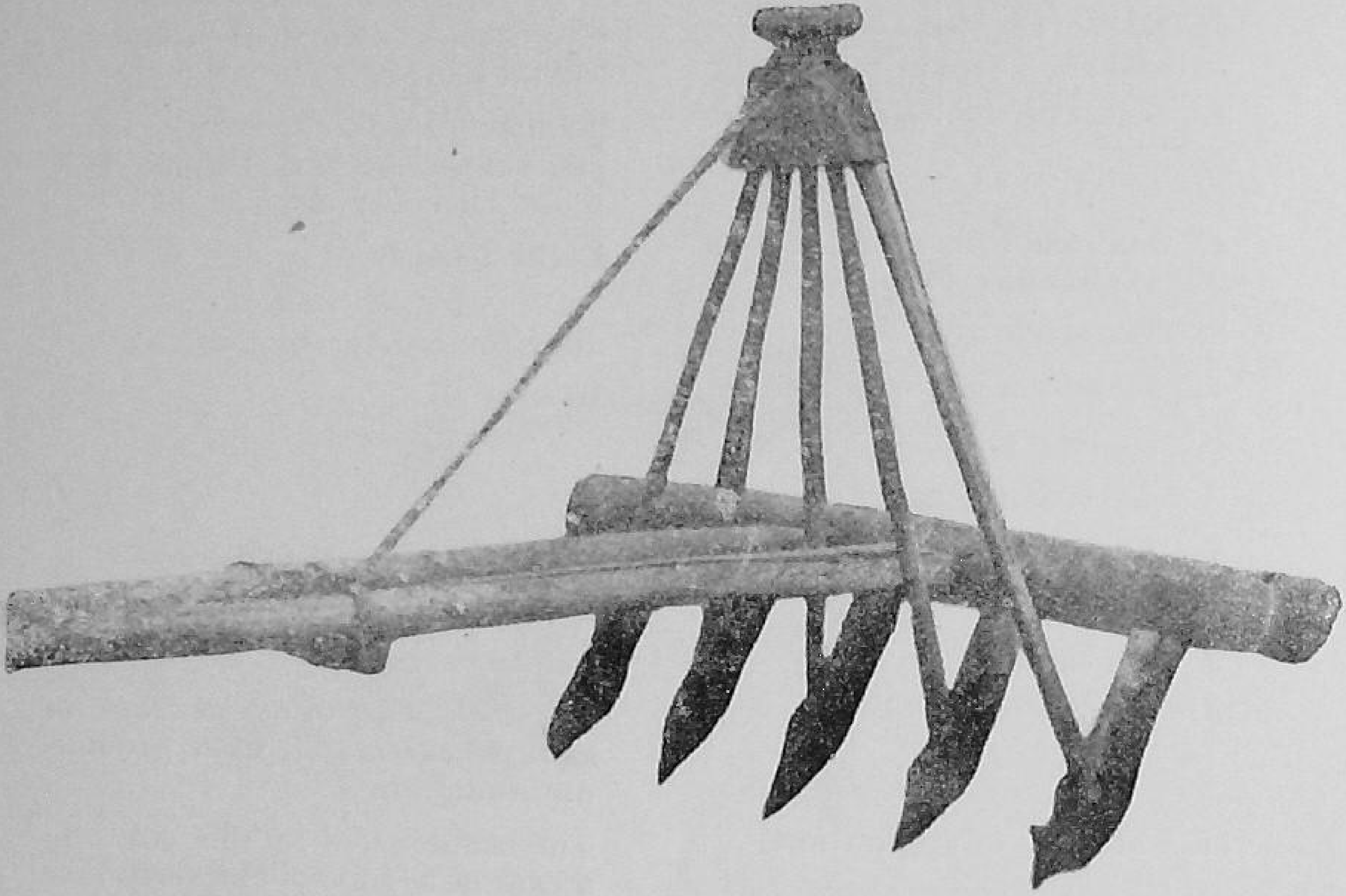
Four-Tyned Drill (Mehsana) Bombay

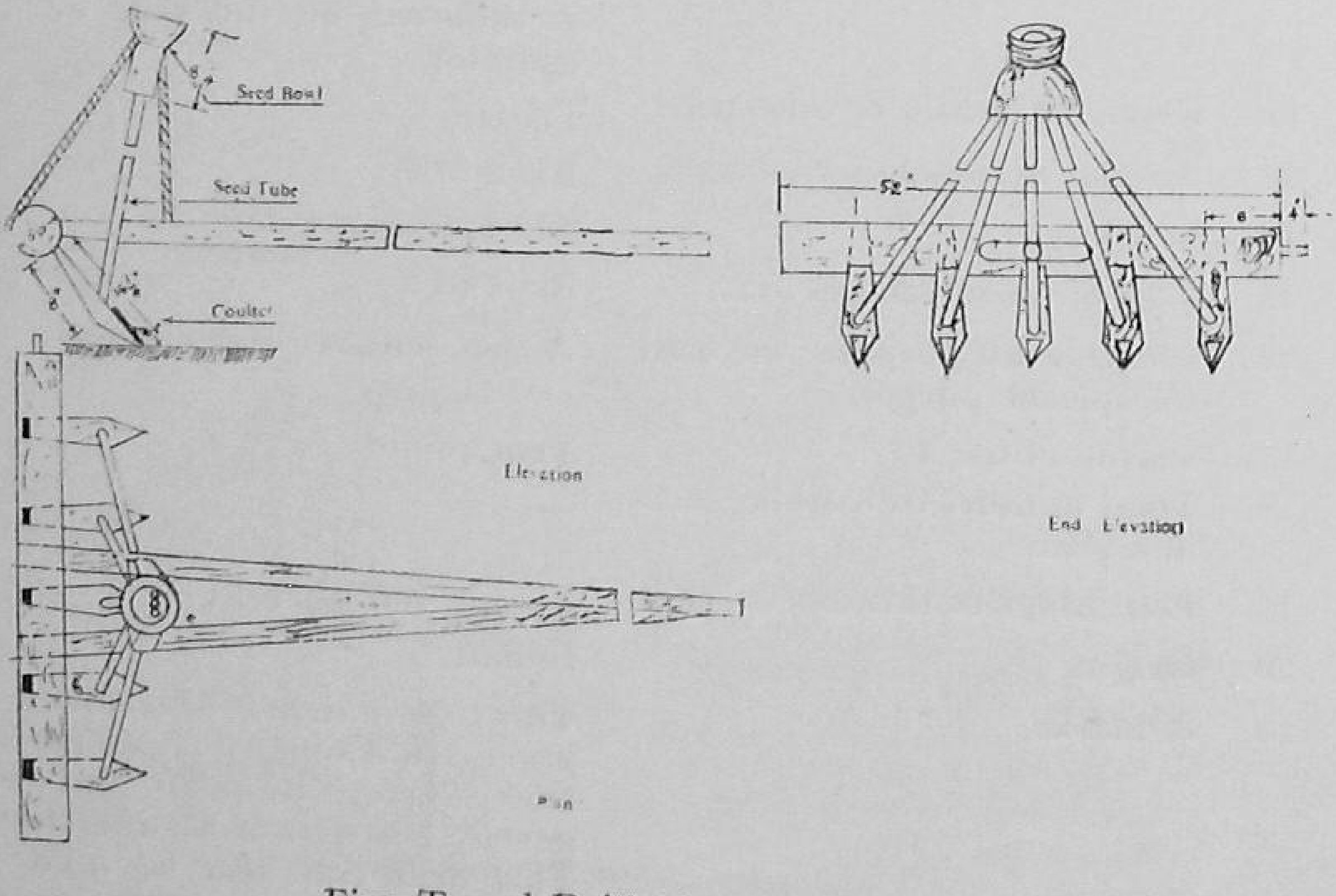
SEED DRILLS

Four-Tyned Drill—Chawad, Naktal-Kurgi (Bombay)

1. Classification	Sowing implement
2. Name (English and local)	Four-tyned seed drill—Chawad, Naktal-Kurgi
3. Name of the State and District	Bombay—Mehsana, Poona, Dhulia, Ahmednagar, Kolhapur, Belgaum, Dharwar, Baroda
4. Manufacturers and source of availability	Local artisans
5. Materials used	Shisham, Babul, Sal and teak
6. Weight of the implement	50 to 80 lb.
(i) Iron part	—
(ii) Wooden part	—
7. Operating power	Two bullocks and two persons
8. Cost	Rs. 30 to 40
9. Service life	5 to 10 years
10. Usage	For line sowing of mixed crops of *bajra*, wheat, maize, *jowar*, groundnut and gram
11. Method of application	The beam is tied to the yoke by means of a rope. The seed rate is adjusted by the skill of the operator
12. Repaired locally or otherwise	Locally
13. Annual maintenance charges	Rs. 3 to 6
14. Work rate	3 to 5 acres per day
15. Cost of operation per acre	Rs. 1 to 2
16. Whether all purpose or used for specific purpose	As per remarks under usage
17. Season of use	Year round
18. Total number of working days in a year	—
19. Percentage of farmers using it	Almost 100 per cent
20. Origin	Indian
21. Remarks	This type of drill is also found in practice in Chingleput and parts of North Arcot, Ramnad and Tinnevelly Districts of Madras State. This drill can also be used for sowing cotton by blocking the middle coulters.

PLATE 87





Five-Tyned Drill (Amreli) Bombay

SEED DRILLS

Five-Tyned Drill—Dantal, Panchfani Pabhar, Kurgi (Bombay)

1.	Classification	Sowing implement
2.	Name (English and local)	Five-tyned seed drill—Dantal, Panchfani Pabhar, Kurgi
3.	Name of the State and District	Bombay—Amreli, Mehsana
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Shisham, Babul, Sal, teak, bamboo and mild steel.
6.	Weight of the implement	75 to 80 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and three persons
8.	Cost	Rs. 30 to 32
9.	Service life	10 years
10.	Usage	For line sowing of mixed crop of *bajra, tur, jowar,* cotton, groundnut, wheat
11.	Method of application	The beam is tied to the yoke by means of a rope. The seed rate is controlled by the operator with the movement of his hand
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 2 to 6
14.	Work rate	3 to 4 acres per day
15.	Cost of operation per acre	About Rs. 2
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	This is an all purpose seed drill. The depth of sowing is about 2.5 inches. The average draft is about 120 lb.

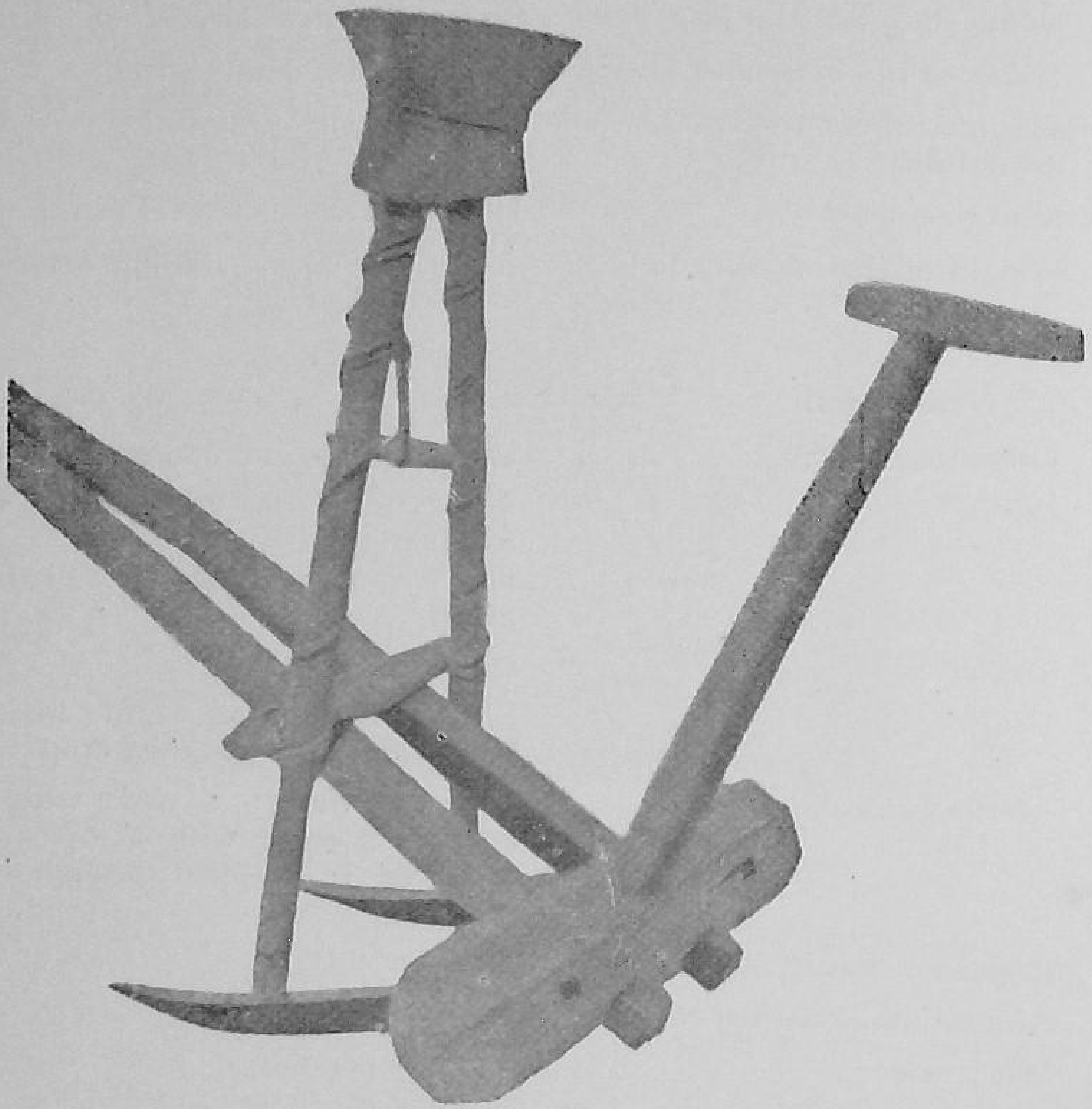
Seed Drill—Pore Hal – Himachal Pradesh

SEED DRILLS

Seed Drill—Pore Hal (Himachal Pradesh)

1.	Classification	Sowing implement
2.	Name (English and local)	Seed drill—Pore Hal
3.	Name of the State and District	Himachal Pradesh—Sirmur
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Hollow bamboo or sheet metal
6.	Weight of the implement	About 1.5 lb. (for seeding attachment only)
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 2 to 3 for pore made of bamboo Rs. 7 for pore made of sheet metal
9.	Service life	3 to 4 years
10.	Usage	For line sowing of wheat, maize barley and various other crops
11.	Method of application	The attachment is tied with a country plough with a rope and the seed is dropped through the pore
12	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.25 to 0.50
14.	Work rate	0.6 acre per day
15.	Cost of operation per acre	Rs. 7 to 8
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	Nominal
20.	Origin	Indian
21.	Remarks	This type of seeding attachment (pore) is also found in practice in practically all the Districts of the Punjab State, particularly in Gurgaon, Amritsar, and Gurdaspur The depth of sowing ranges from 3 to 4 inches.

PLATE 89

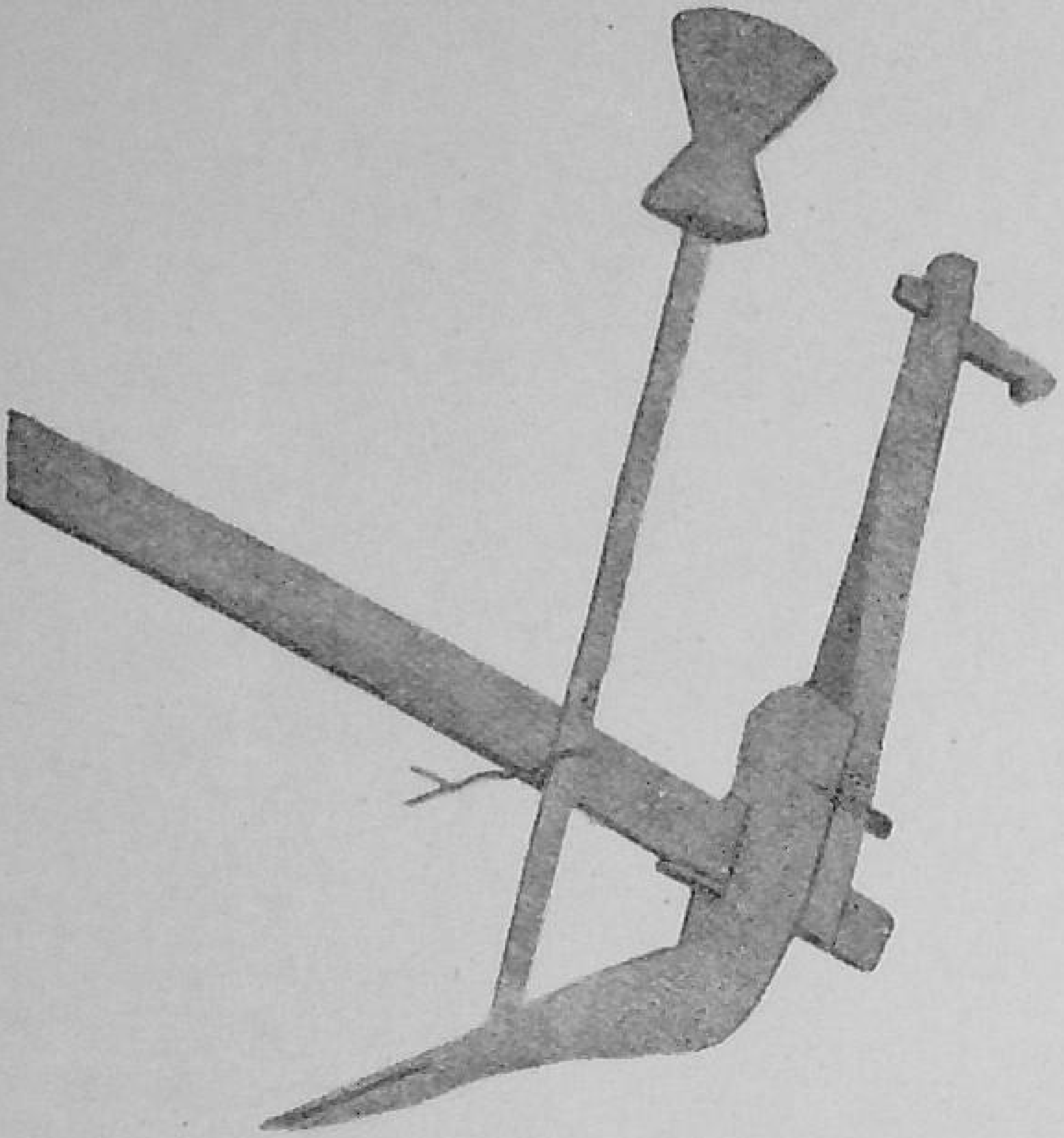


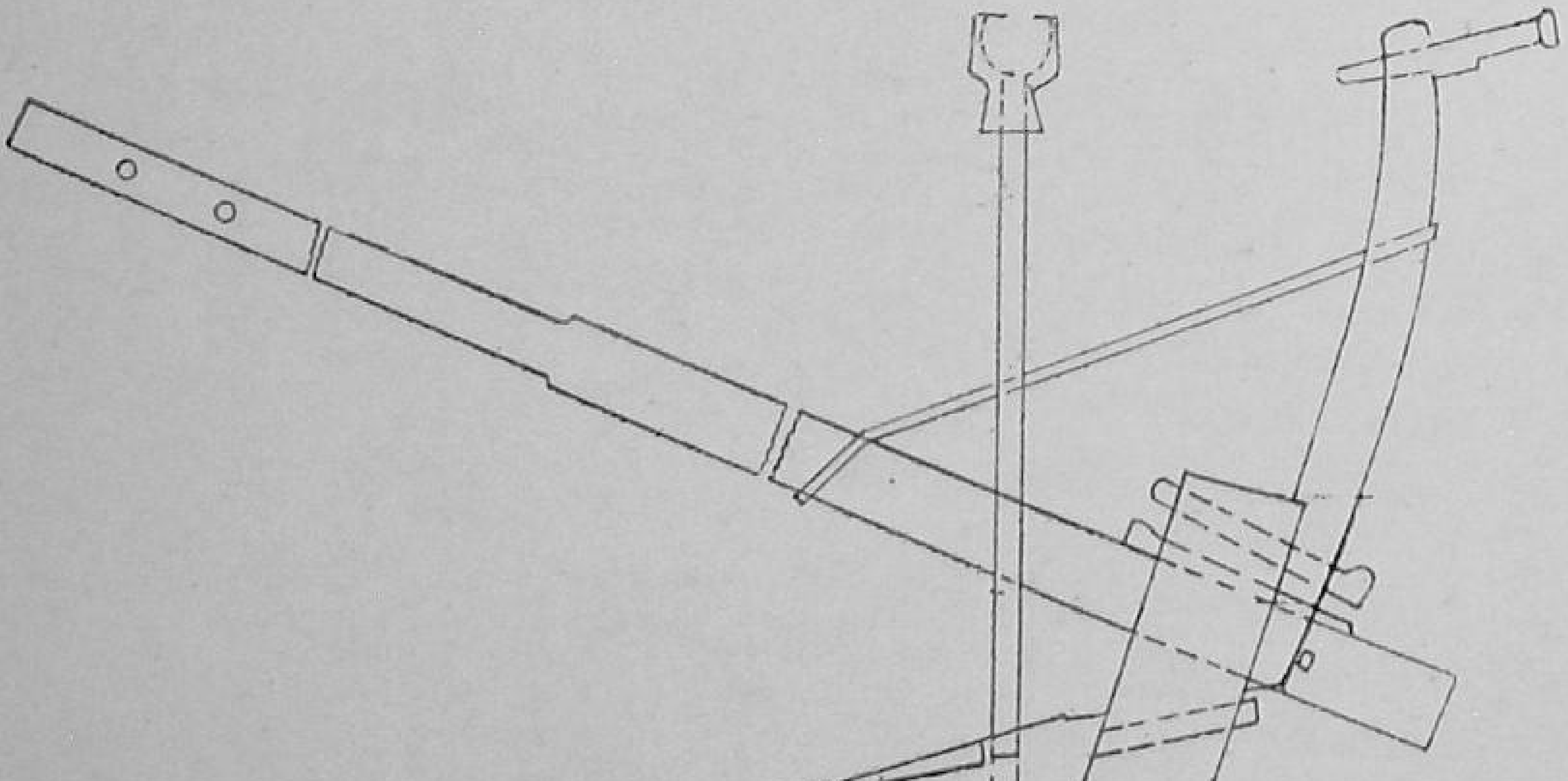
Two-Tyned Drill (Sehore) Madhya Bharat

SEED DRILLS

Two-Tyned Drill—Dophan, Dofana (Madhya Bharat)

1.	Classification	Sowing implement
2.	Name (English and local)	Two tyned seed-drill—Dophan, Dofana
3.	Name of the State and District	Madhya Bharat and Madhya Pradesh – Sehore, Mandsour and Malwa Districts
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Babul, bamboo and mild steel
6.	Weight of the implement	60—100 lb
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and two men
8.	Cost	Rs. 15 to 30
9.	Service life	4—8 years
10.	Usage	For line sowing of *jowar*, maize, cotton, wheat, and gram
11.	Method of application	Implement is hitched to the yoke by means of beam and ropes. One man drives the bullocks and generally a woman drops the seeds into the seed bowl
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	About Re. 1
14.	Work rate	2 to 2.5 acres per day
15.	Cost of operation per acre	Rs. 3
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	Almost 100 per cent
20.	Origin	Indian
21.	Remarks	It is also found in use in the following regions. (1) Warangal District of Andhra Pradesh (2) Jhansi District of Uttar Pradesh.





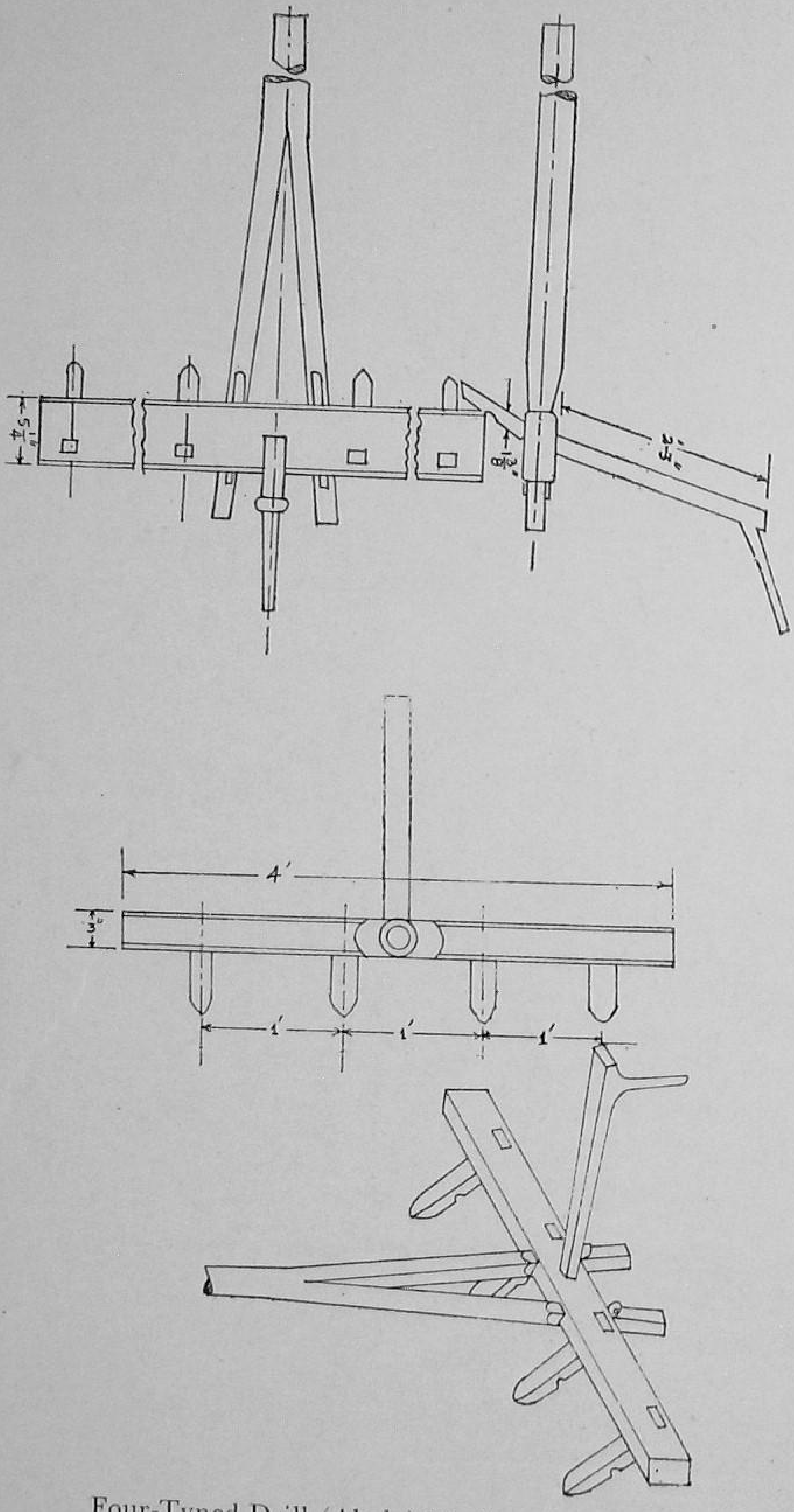
Single-Row Drill (Hoshangaba l) Madhya Pradesh

SEED DRILLS

Single-Row Drill—Nai, Nadi, Nari, (Madhya Pradesh)

1.	Classification	Sowing implement
2.	Name (English and local)	Single-row seed drill – Nai, Nadi, Pongrra-Bansa, Nari
3.	Name of the State and District	Madhya Pradesh—Hoshangabad, Chhindwara, Jabalpur *
4	Manufacturers and source of availability	Village artisans
5.	Materials used	Babul, hollow bamboo and iron
6.	Weight of the implement	0 to 60 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and two persons
8.	Cost	Rs. 8 to 18
9.	Service life	—
10.	Usage	For line sowing of *rabi* crops such as wheat, gram, *sarson* and linseed
11.	Method of application	The beam of the drill is tied to the yoke with ropes. One man drives the bullocks and generally one woman drops the seeds through seed bowl
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	1 to 2 acres per day
15.	Cost of operation per acre	Rs. 5 to 6
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	*Rabi* sowing season
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	Almost 100 per cent
20.	Origin	Indian
21.	Remarks	

*An identical type of seed drill is found in use in the following areas : (1) Sehore District of Bhopal State ; (2) Gwalior, Bhind, Shoepur, Guna, Jhabua, Districts of Madhya Bharat ; (3) Tikamgarh, Chhatarpur, Panna, Sarna, Rewa, Sidhi, Shahdol of Vindhya Pradesh ; (4) Mirzapur, Aligarh, Meerut, Bareilly Districts of Uttar Pradesh



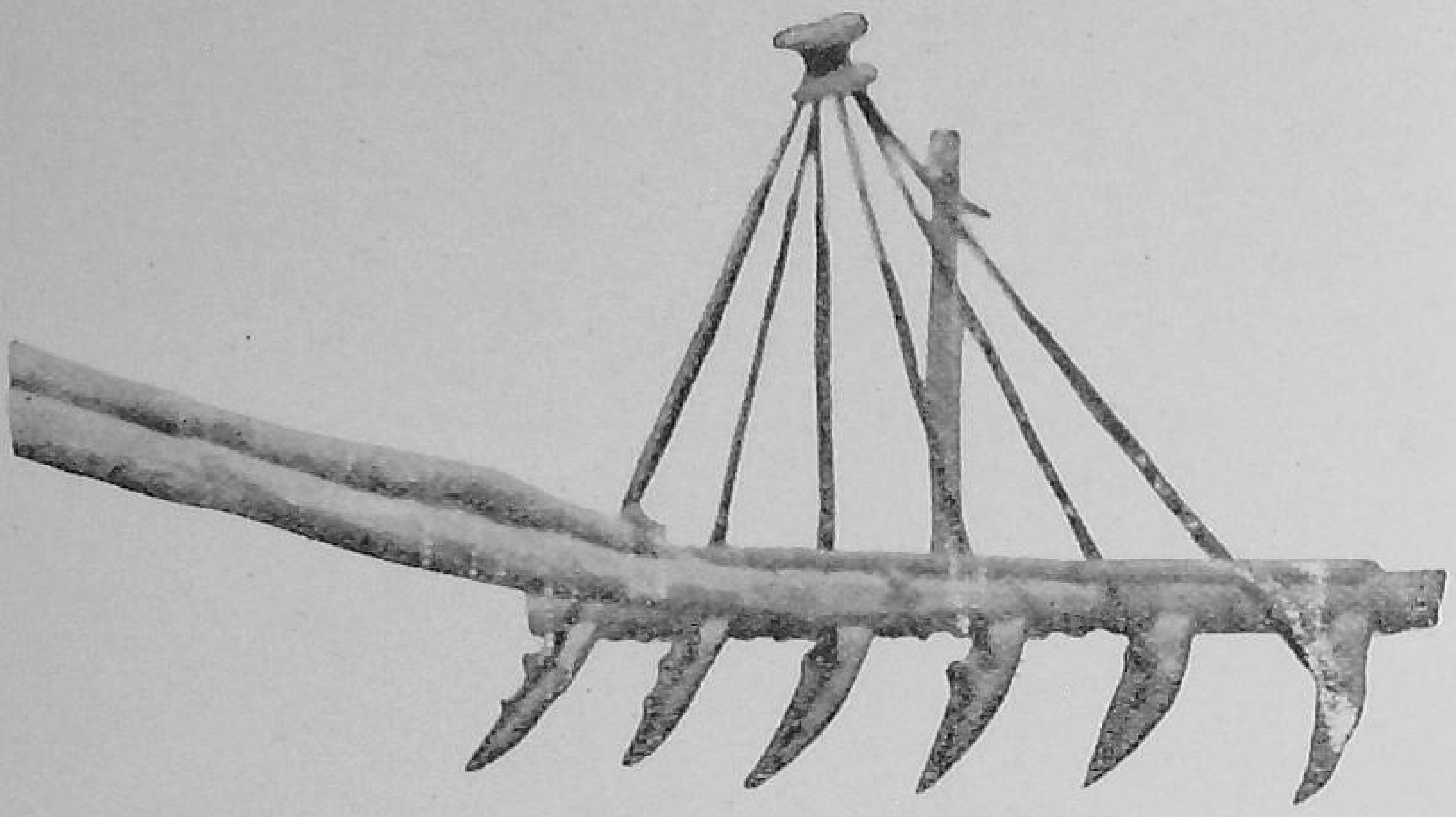
Four-Tyned Drill (Akola) Madhya Pradesh
(without seed bowl and tubes)

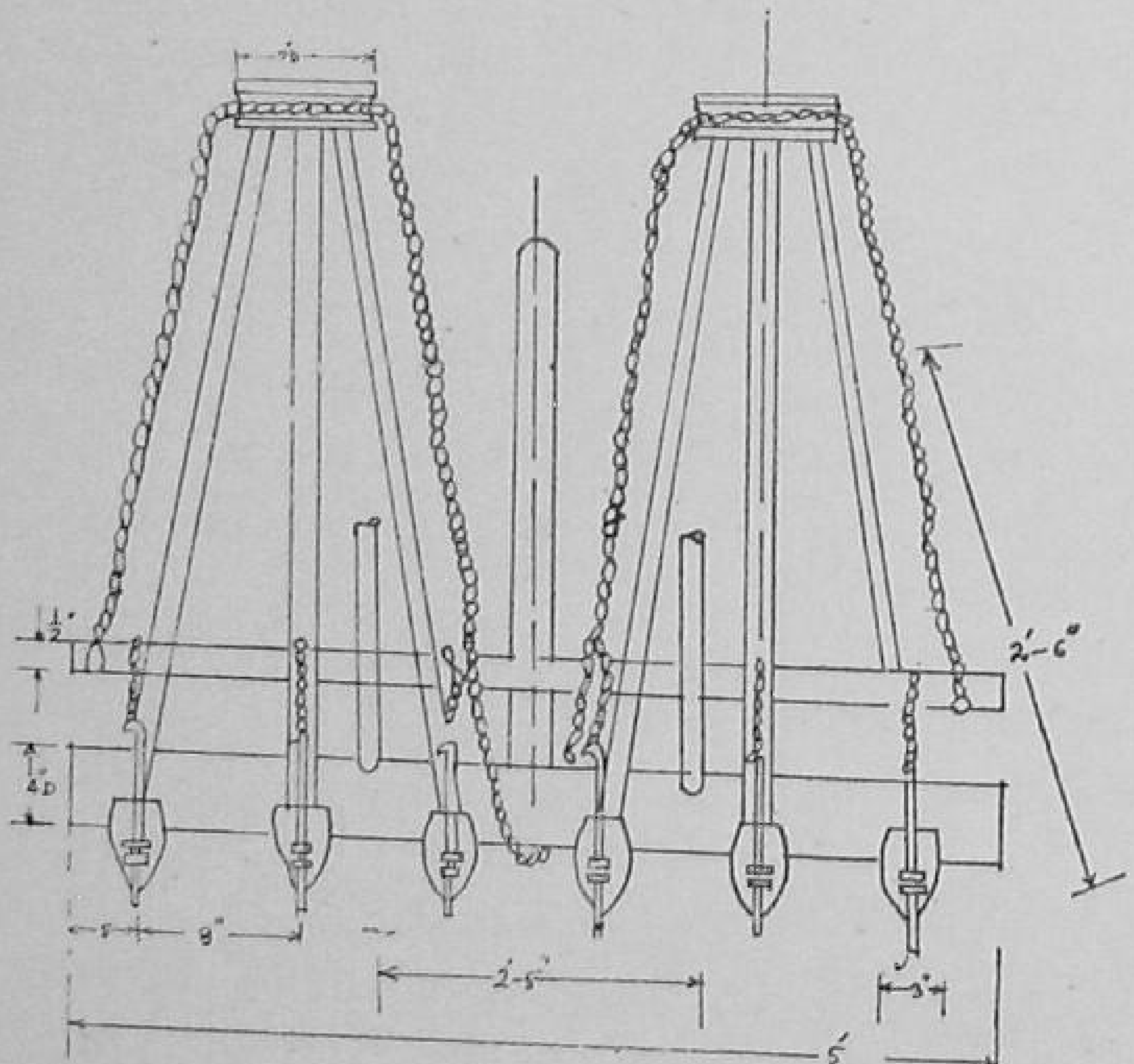
SEED DRILLS

FOUR-TYNED DRILL—ARGADA (MADHYA PRADESH)

1.	Classification	Sowing implement
2.	Name (English and local)	Four-tyned seed drill—Argada
3.	Name of the State and District	Madhya Pradesh—Akola, Nagpur, Wardha
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Babul wood for body, handle and tynes
6.	Weight of the implement	69 to 80 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and four men
8.	Cost	Rs. 10 to 16
9.	Service life	3 to 6 years
10.	Usage	For line sowing of groundnut
11.	Method of application	The implement is hitched to the yoke with a beam. One of the five tynes of the implement is used as marker. To the remaining tynes seed tubes are attached by means of ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	2.5 to 3 acres per day
15.	Cost of operation per acre	About Rs. 2.50
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Sowing season of groundnut
18.	Total number of working days in a year.	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	The spacings between rows are 12 inches (fixed). The average depth of sowing is about 3 inches.

PLATE 92





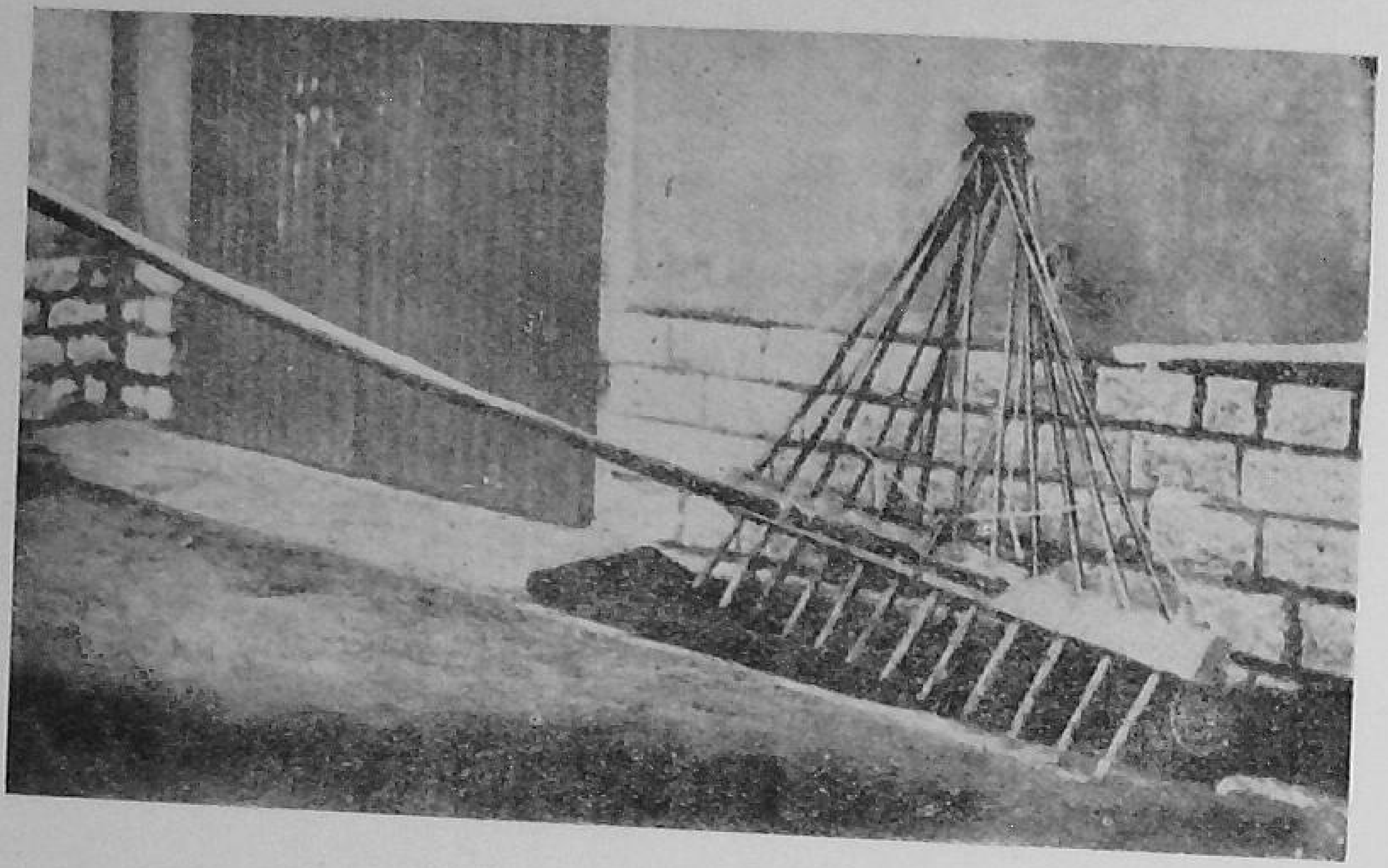
Six-Tyned Drill (Chingleput) Madras

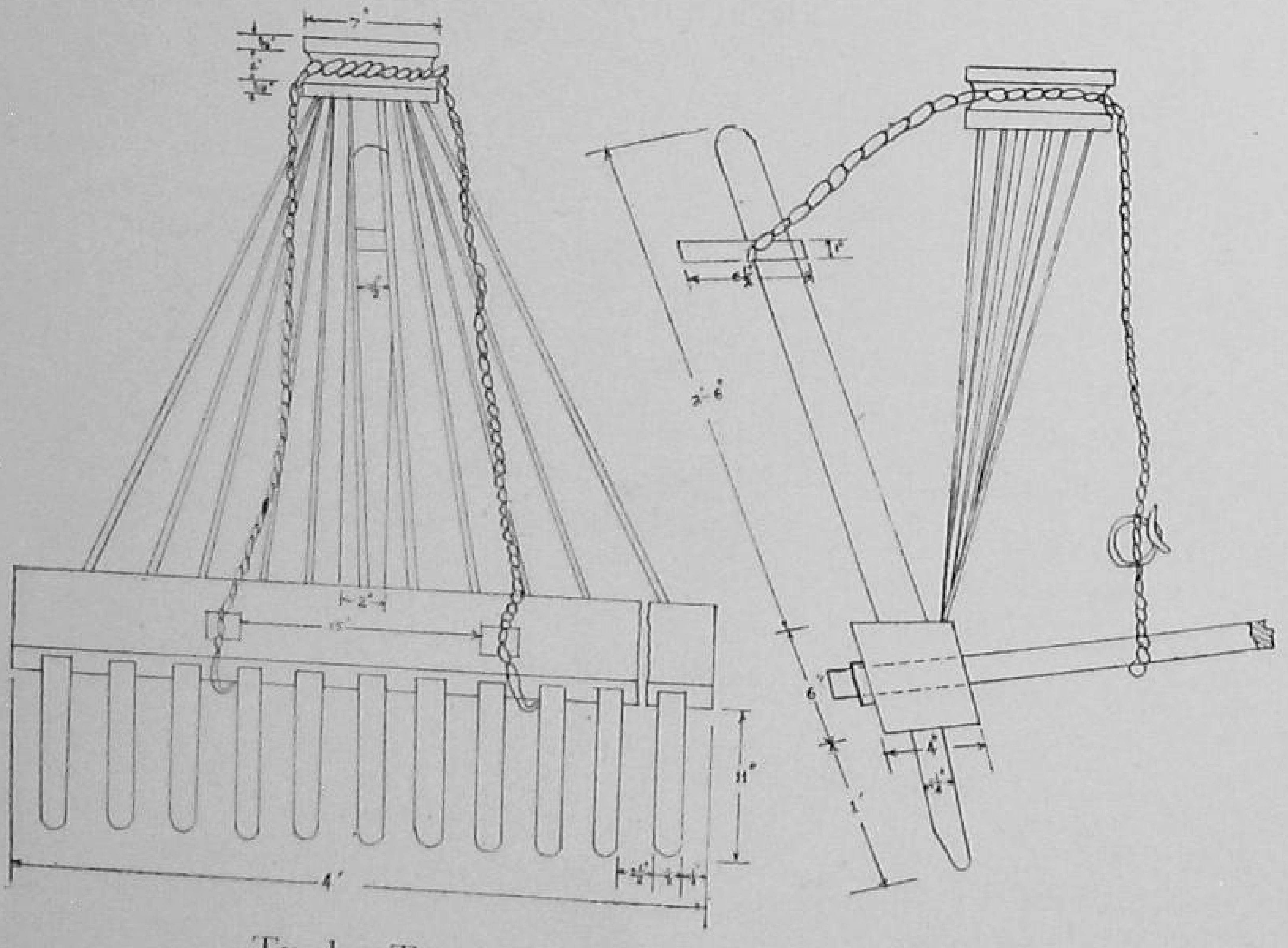
SEED DRILLS

Six-Tyned Drill—Gorru (Madras)

1.	Classification	Sowing implement
2.	Name (English and local)	Six-tyned seed drill—Gorru
3.	Name of the State and District	Madras—Chingleput
4.	Manufacturers and source of availability	Village artisan
5.	Materials used	Karuvelam or Babul wood for beam and handle, mango or Tekku wood for seed bowl, bamboo for seed tubes and mild steel for share
6.	Weight of the implement	50 to 60. lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	A pair of bullocks and two men
8.	Cost	Rs. 25 to 30
9.	Service life	6 to 8 years
10.	Usage	For line sowing of paddy and millets like *ragi, cholam*
11.	Method of application	It is hitched to the yoke by means of a beam. One man guides the implement and second man feeds the bowl by rotating movement to distribute the seeds uniformly
12.	Repaired locally or otherwise	Locally.
13.	Annual maintenance charges	Rs. 2.50
14.	Work rate	5 acres per day
15.	Cost of operation per acre	Rs. 1.50
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 15 per cent
20.	Origin	Indian
21.	Remarks	The average draft varies from 150 to 180 lb. The depth of penetration is about 2 inches. This type of seed drill is also found in Kolhapur District of Bombay State.

PLATE 93



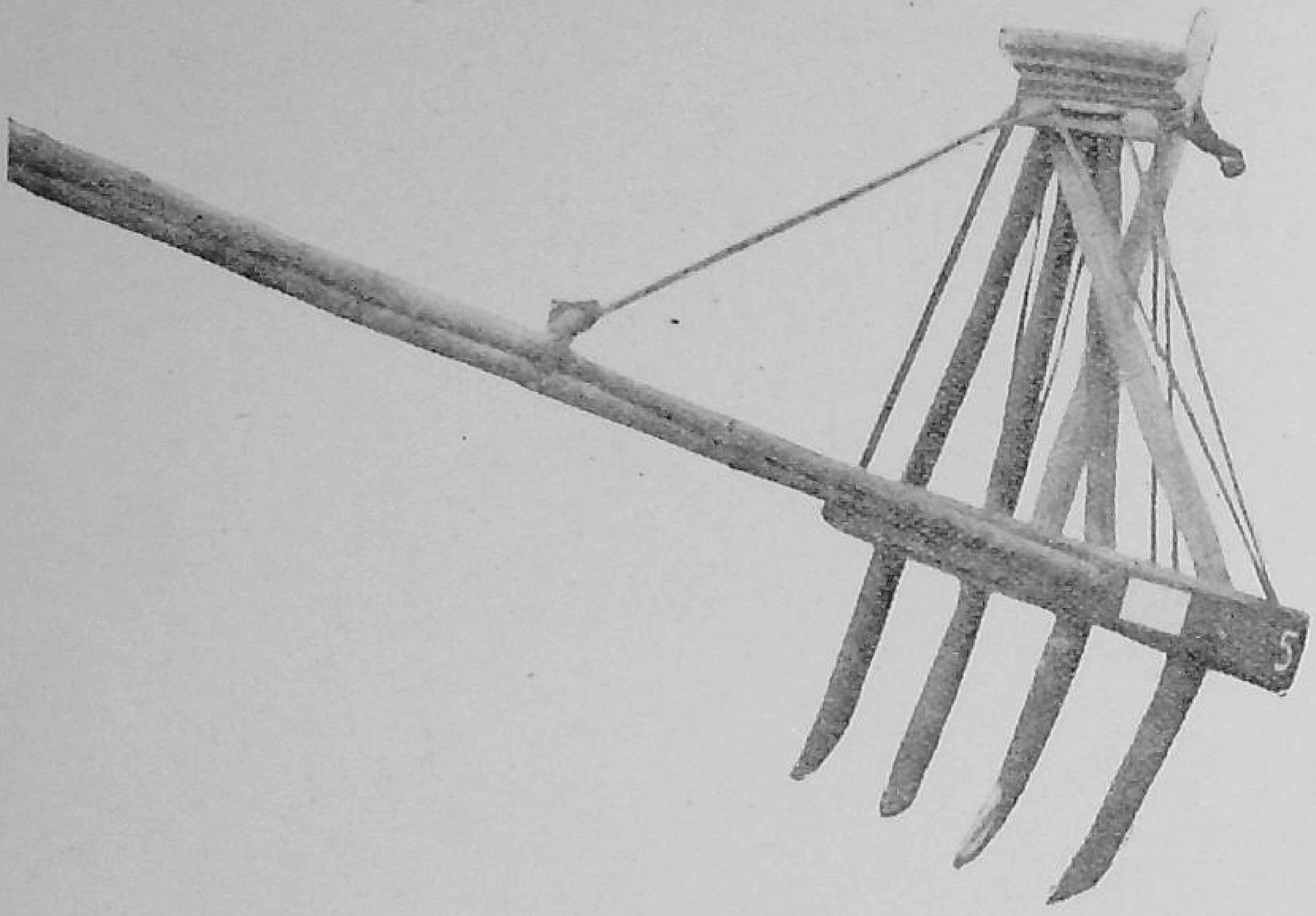


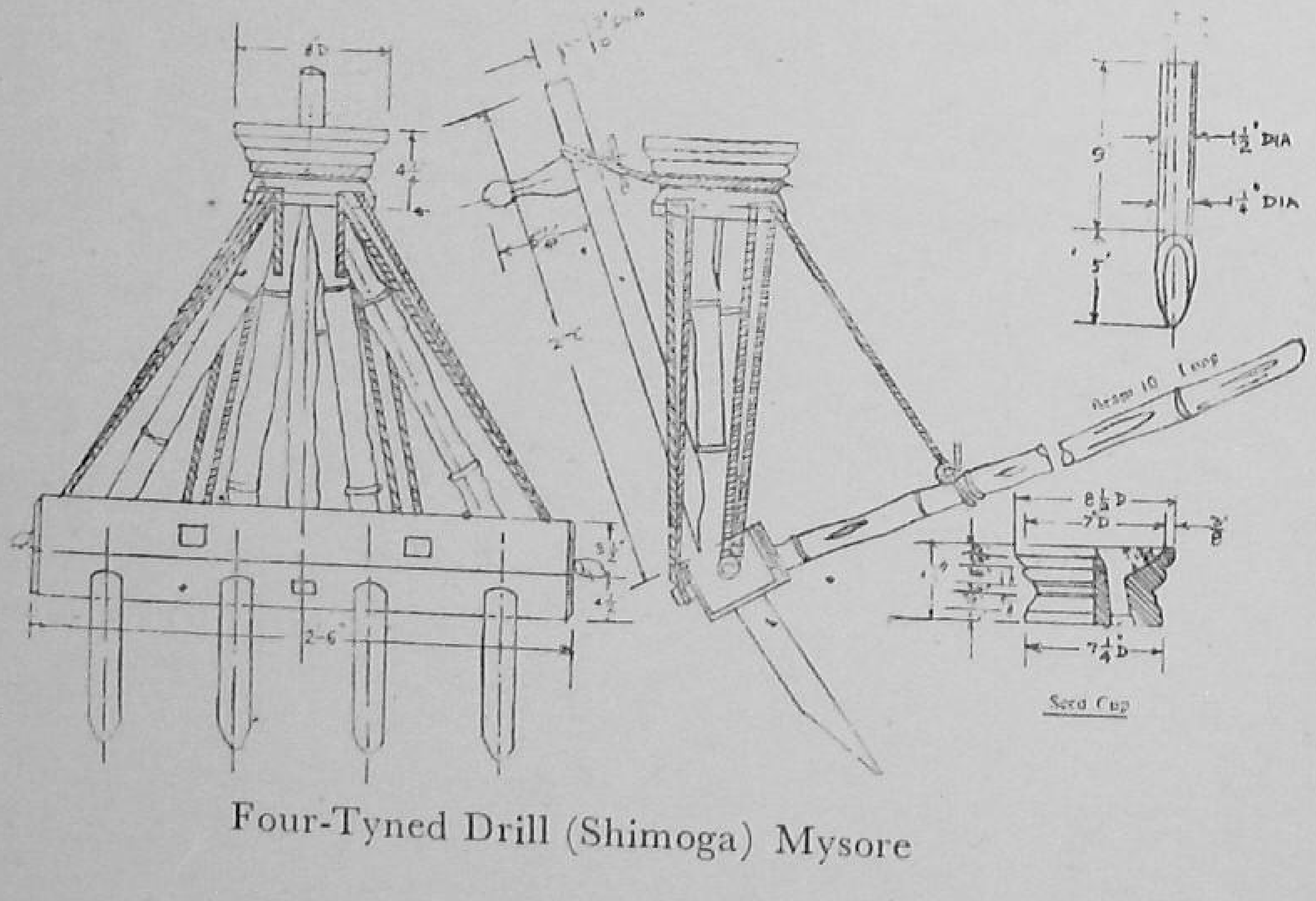
Twelve-Tyned Drill (Chingleput) Madras

SEED DRILLS

Twelve-Tyned Drill—Gorru (Madras)

1.	Classification	Sowing implement
2.	Name (English and local)	Twelve-tyned seed drill—Gorru
3.	Name of the State and District	Madras—Chingleput
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Bamboo and wood
6.	Weight of the implement	30 to 35 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	A pair of bullocks and two men
8.	Cost	Rs. 18 to 20
9.	Service life	4 to 6 years
10.	Usage	For line sowing of *ragi* only
11.	Method of application	It is hitched to the yoke with a beam. One man drives the bullocks and other feeds the seed bowl by rotating movement of hand to distribute the seeds uniformly through the 12 tubes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 3
14.	Work rate	6 acres per day
15.	Cost of operation per acre	Rs. 1.25 to 1.50
16.	Whether all purpose or used for specific purpose	For sowing of *ragi* only
17.	Season of use	Sowing season of *ragi*
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 10 per cent
20.	Origin	Indian
21.	Remarks	The draft is about 120 lb. on an average. The depth of working is about 1.25 inches. The spacing ranges from 4 to 6 inches.



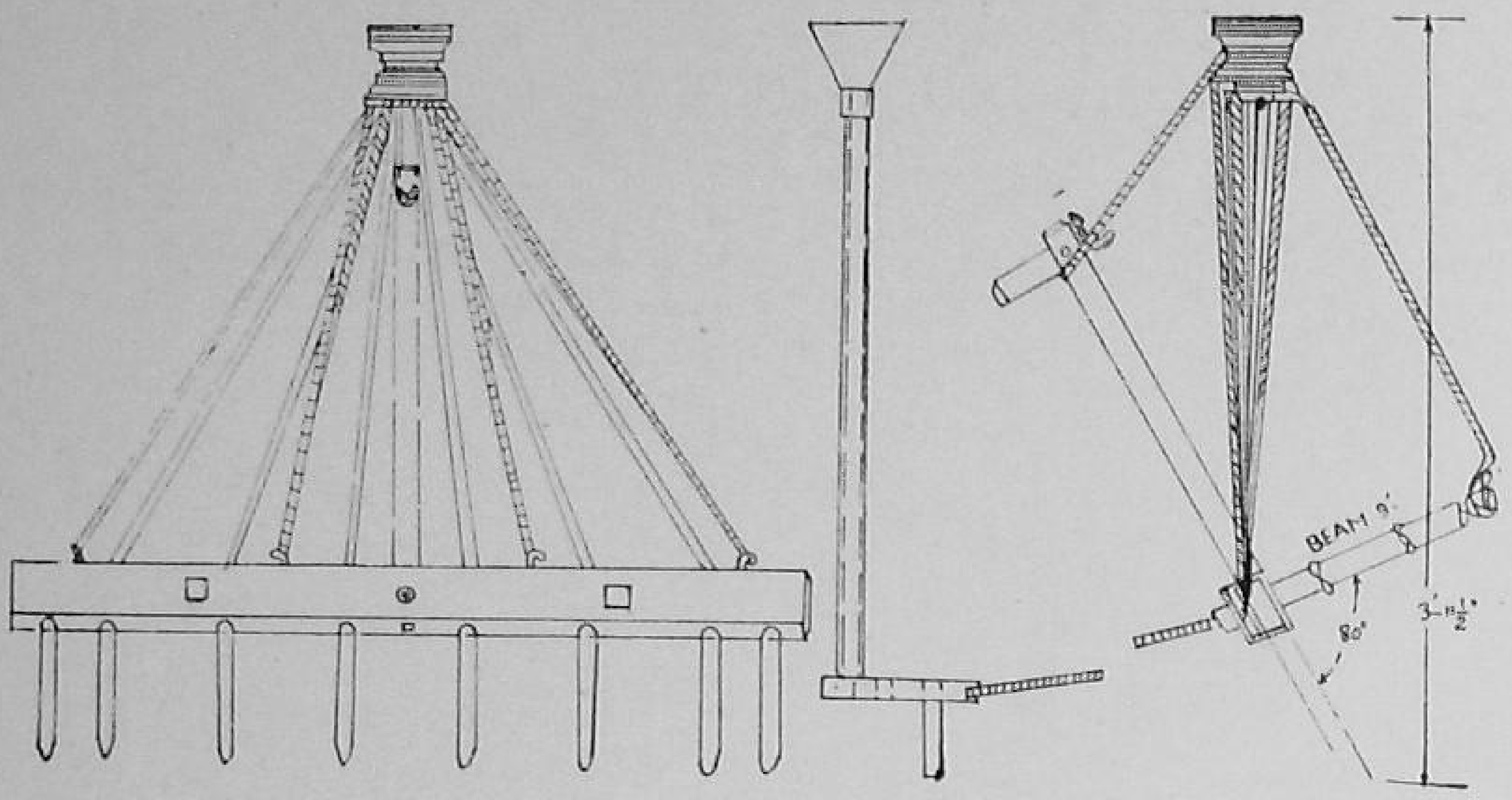


Four-Tyned Drill (Shimoga) Mysore

SEED DRILLS

Four-Tyned Drill—Koorige (Mysore)

1.	Classification	Sowing implement
2.	Name (English and local)	Four-tyned seed drill—Koorige
3.	Name of the State and District	Mysore—Shimoga, Tumkur
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Jack or Rose or Kooly wood for seed bowl. Babul wood for head piece. Bamboo or iron for seed tubes and tynes
6.	Weight of the implement	25 to 30 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and two men
8.	Cost	Rs. 12 to 22
9.	Service life	
10.	Usage	For line sowing of paddy, coriander, Bengal gram, wheat, *ragi*, *jola*, horse gram, red gram and groundnut, etc.
11.	Method of application	The seed drill is hitched to the yoke with a beam. One man drives the bullocks and other feeds the seed bowl by rotating movement of hand
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	About Rs. 2
14.	Work rate	Rs. 3 to 4 acres per day
15.	Cost of operation per acre	Rs. 1.25 to 1.75
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 90 per cent
20.	Origin	Indian
21.	Remarks	The average draft is about 84 lb. and depth of sowing varies from 2 to 2.5 inches. This type of drill is also reported to be in use in Coorg State.

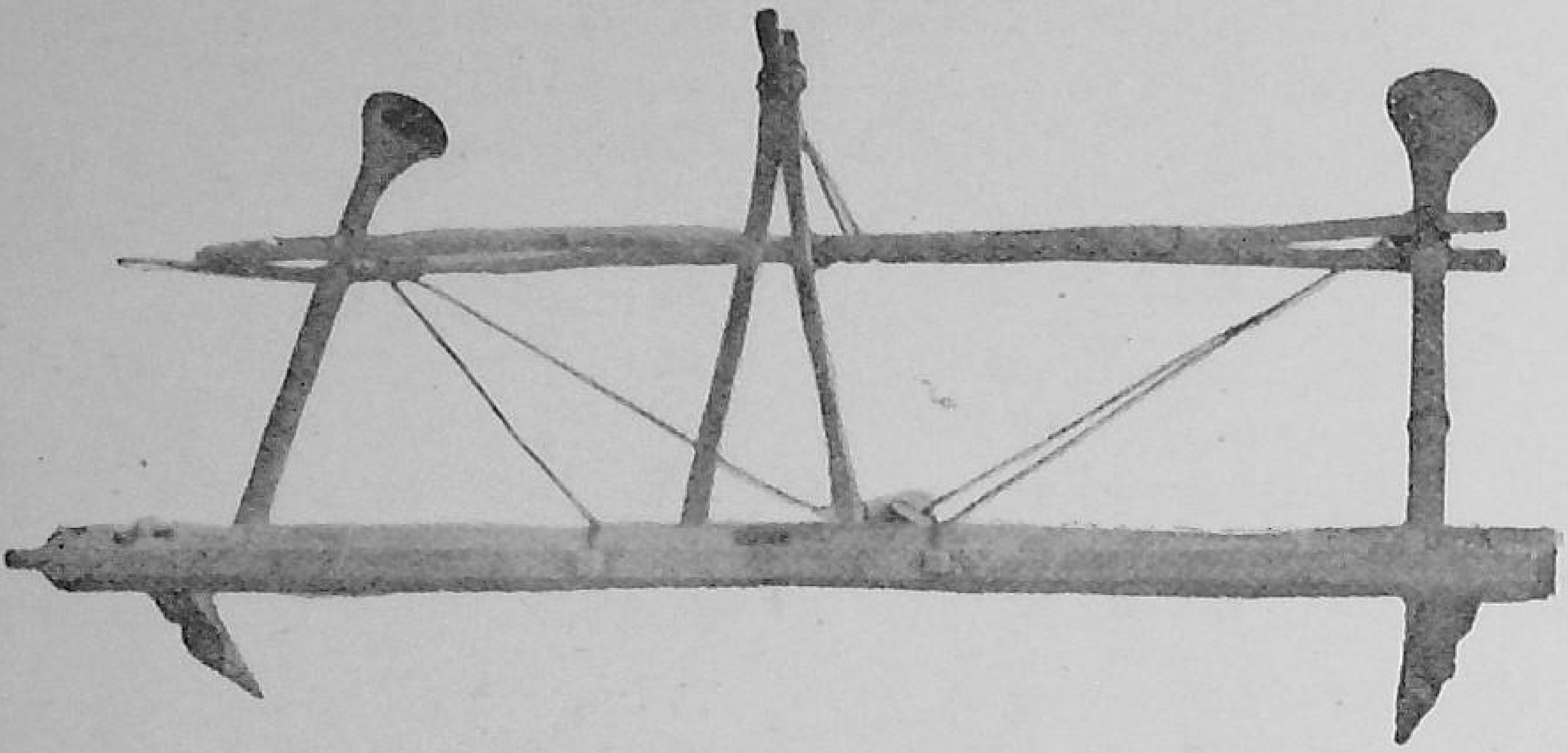


Six-Tyned Seed Drill (Bangalore) Mysore

SEED DRILLS

Six-Tyned Drill—Koorige (Mysore)

1.	Classification	Sowing implement
2.	Name (English and local)	Six-tyned drill—Koorige
3.	Name of the State and District	Mysore—Bangalore
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Rose, Chandan, Neem wood, hollow bamboo and sheet metal
6.	Weight of the implement	26 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and two men
8.	Cost	Rs. 35
9.	Service life	—
10.	Usage	For line sowing of *ragi*
11.	Method of application	The beam is hitched to the yoke by means of a rope. One man drives the bullocks and the other feeds the seed bowl.
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 2 to 3
14.	Work rate	3.5 acres per day
15.	Cost of operation per acre	About Rs. 2
16.	Whether all purpose or used for specific purpose	For sowing of *ragi* only
17.	Season of use	Sowing season of *ragi* only
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 90 per cent
20.	Origin	Indian
21.	Remarks	The average draft in red sandy soils is about 125 lb. The average depth of sowing is about 1 inch.

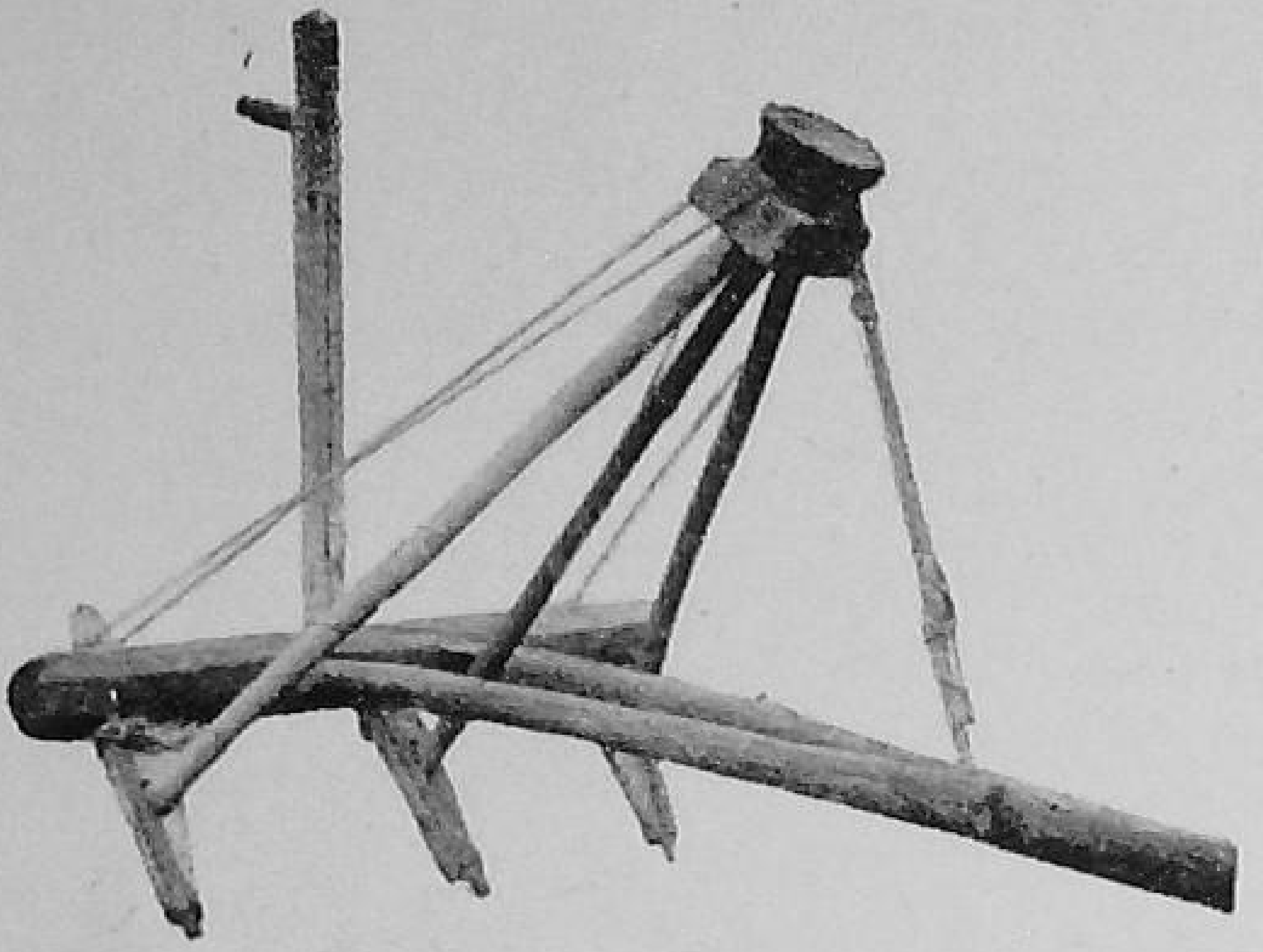


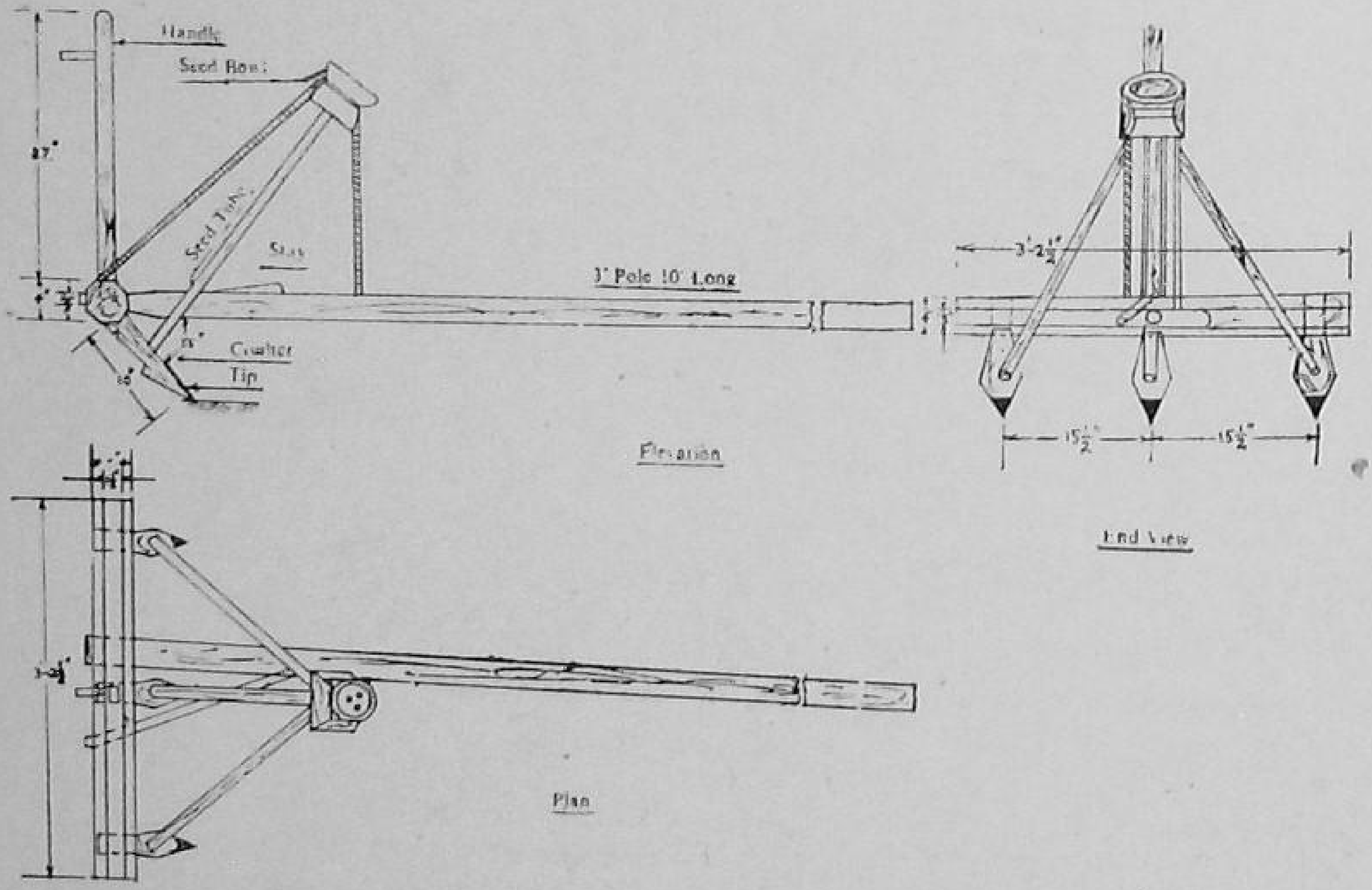
Two-Coultered Drill (Sabar Kantha) Bombay

SEED DRILLS

Two-Coultered Drill—Faidko (Bombay)

1.	Classification	Sowing implement
2.	Name (English and local)	Two-coultered drill—Faidko (in Gujerat)
3.	Name of the State and District	Bombay—Sabar Kantha
4.	Manufacturers and source of availability	Locai artisans
5.	Materials used	Babul, teak, and bamboo
6.	Weight of the implement	52 lb.
	(i) Iron part	—
	(ii) Wooden part	52 lb.
7.	Operating power	One pair of bullocks and one person
8.	Cost	Rs. 15
9.	Service life	5 years
10.	Usage	For sowing of cotton and groundnut
11.	Method of application	The beam of this implement is tied with the yoke by means of rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1.25
14.	Work rate	6 acres per day
15.	Cost of operation per acre	Rs. 1.75
16.	Whether all purpose or used for specific purpose	Used only for cotton and groundnut
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	This drill is used for sowing cotton at 6 feet spacing. There is no device for depth adjustment and for automatic dropping of the seeds and its depth of sowing is $2\frac{1}{2}$ inches.



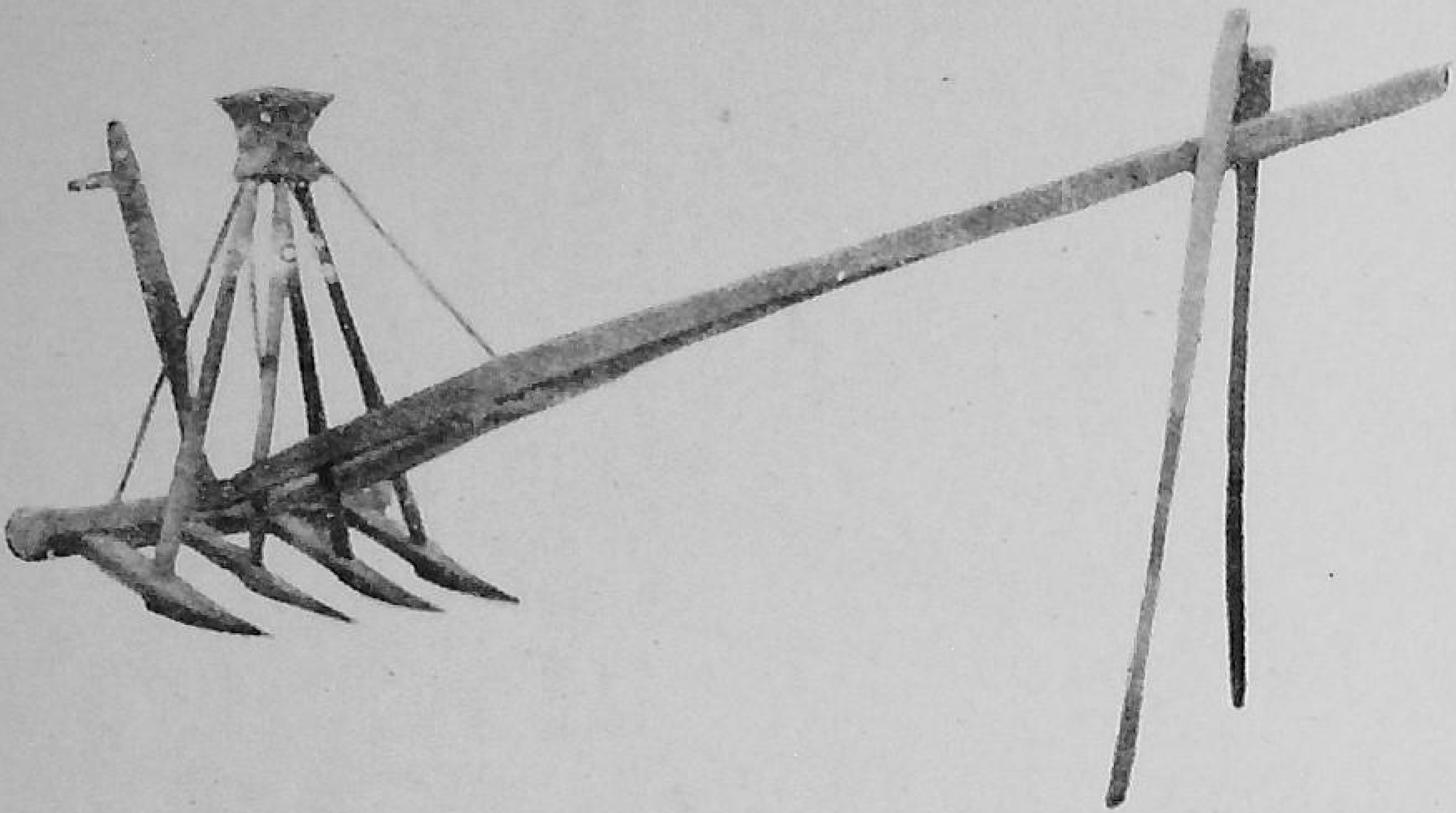


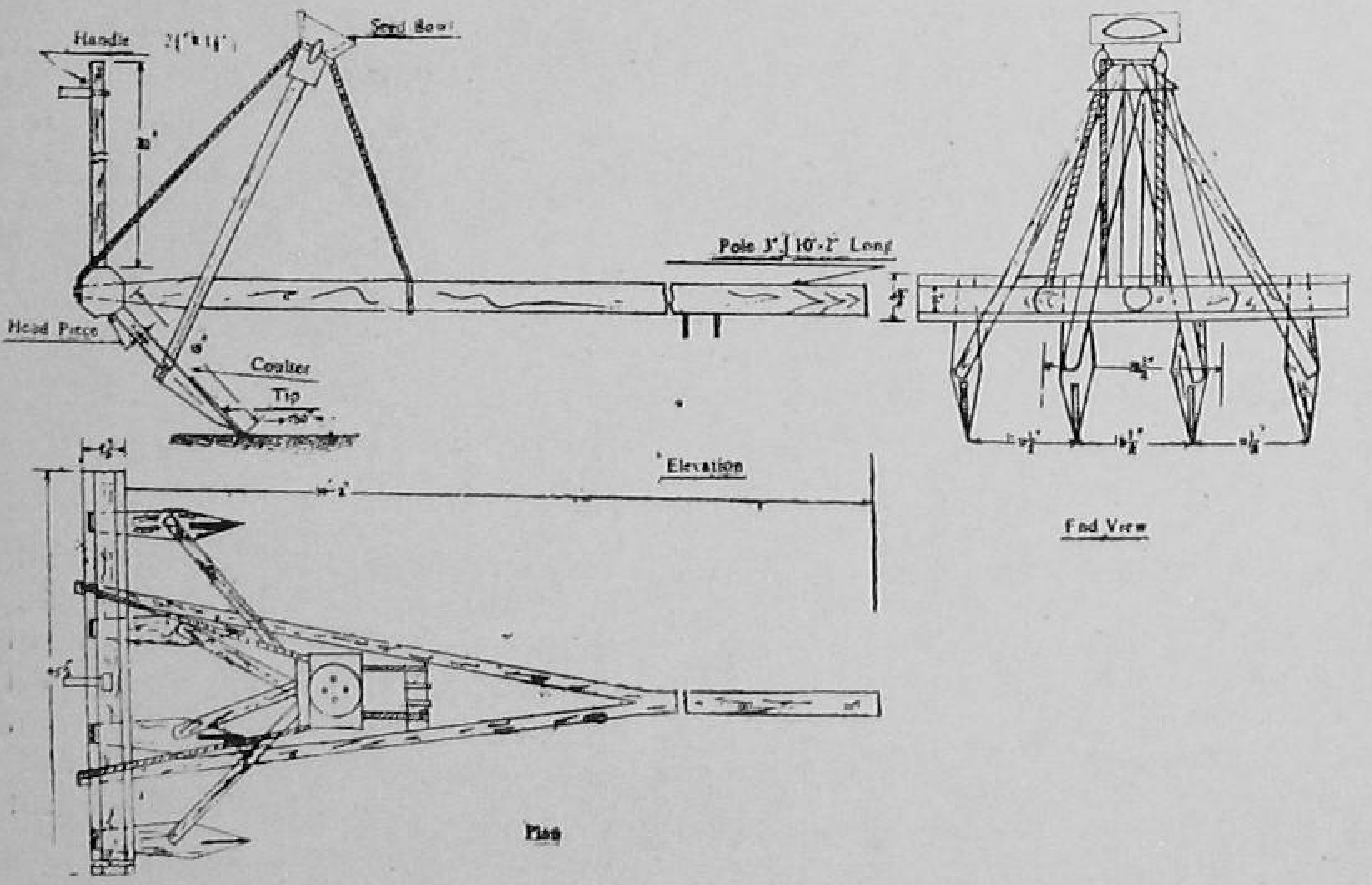
Three-Coultered Drill (Khandesh) Bombay

SEED DRILLS

Three-Coultered Drill—Thiphan (Bombay)

1.	Classification	Sowing implement
2.	Name (English and local)	Three-coultered drill—Thiphan
3.	Name of the State and District	Bombay—Khandesh
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Babul, teak, bamboo
6.	Weight of the implement	53 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	A pair of bullocks and 4 persons
8.	Cost	Rs. 30
9.	Service life	10 years
10.	Usage	For sowing of cotton and *jowar*
11.	Method of application	The beam of the drill is tied to the yoke by means of a rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 2
14.	Work rate	3 acres per day
15.	Cost of operation per acre	Rs. 1.25
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season for use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	There is no device for depth adjustment and automatic dropping of the seed. For adjustment of the seed-rate one has to depend upon the experience of the man who sows. The distance between rows is 15 inches and the depth of sowing 3 inches.





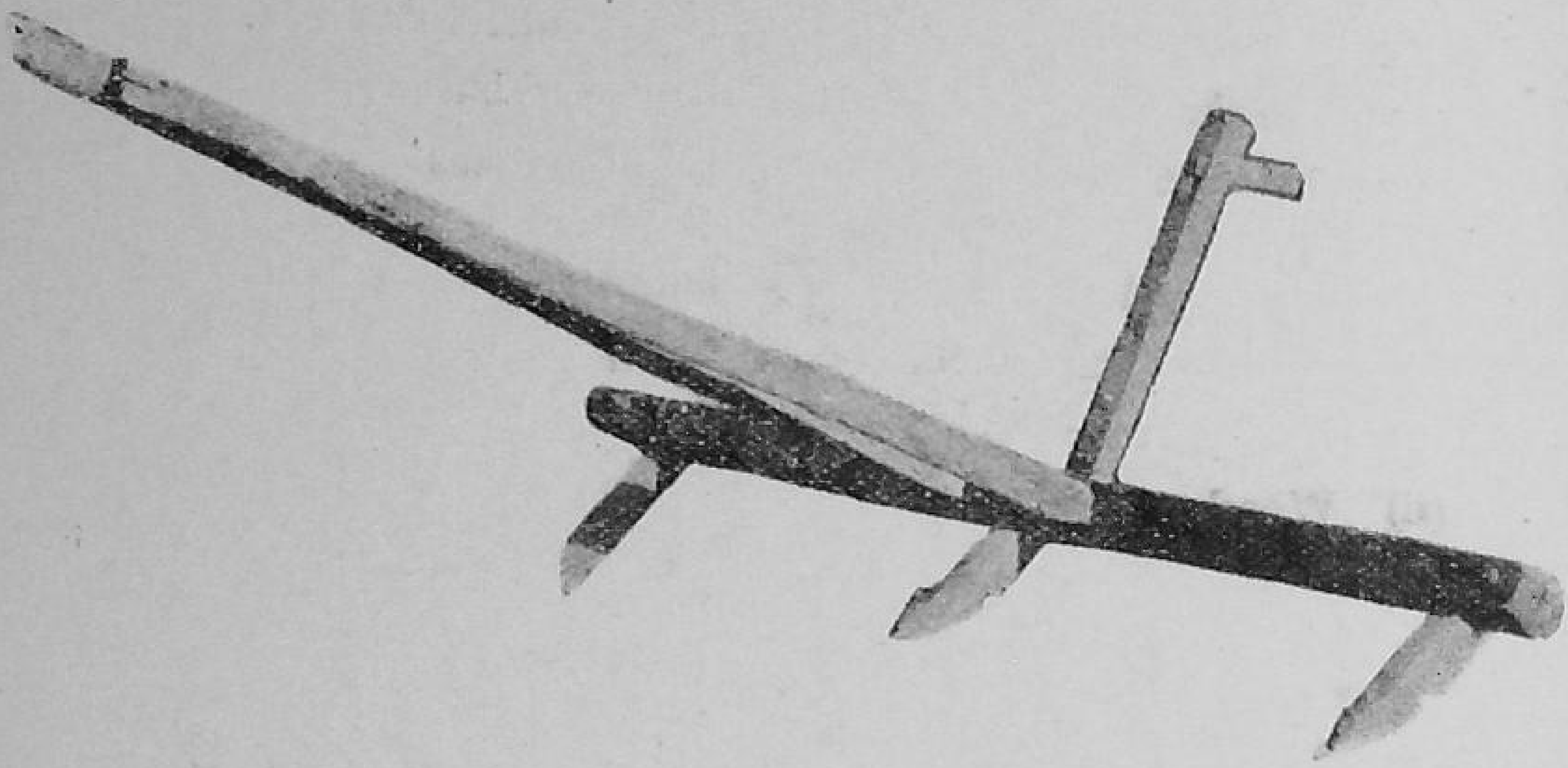
Four-Coultered Drill (Baroda) Bombay

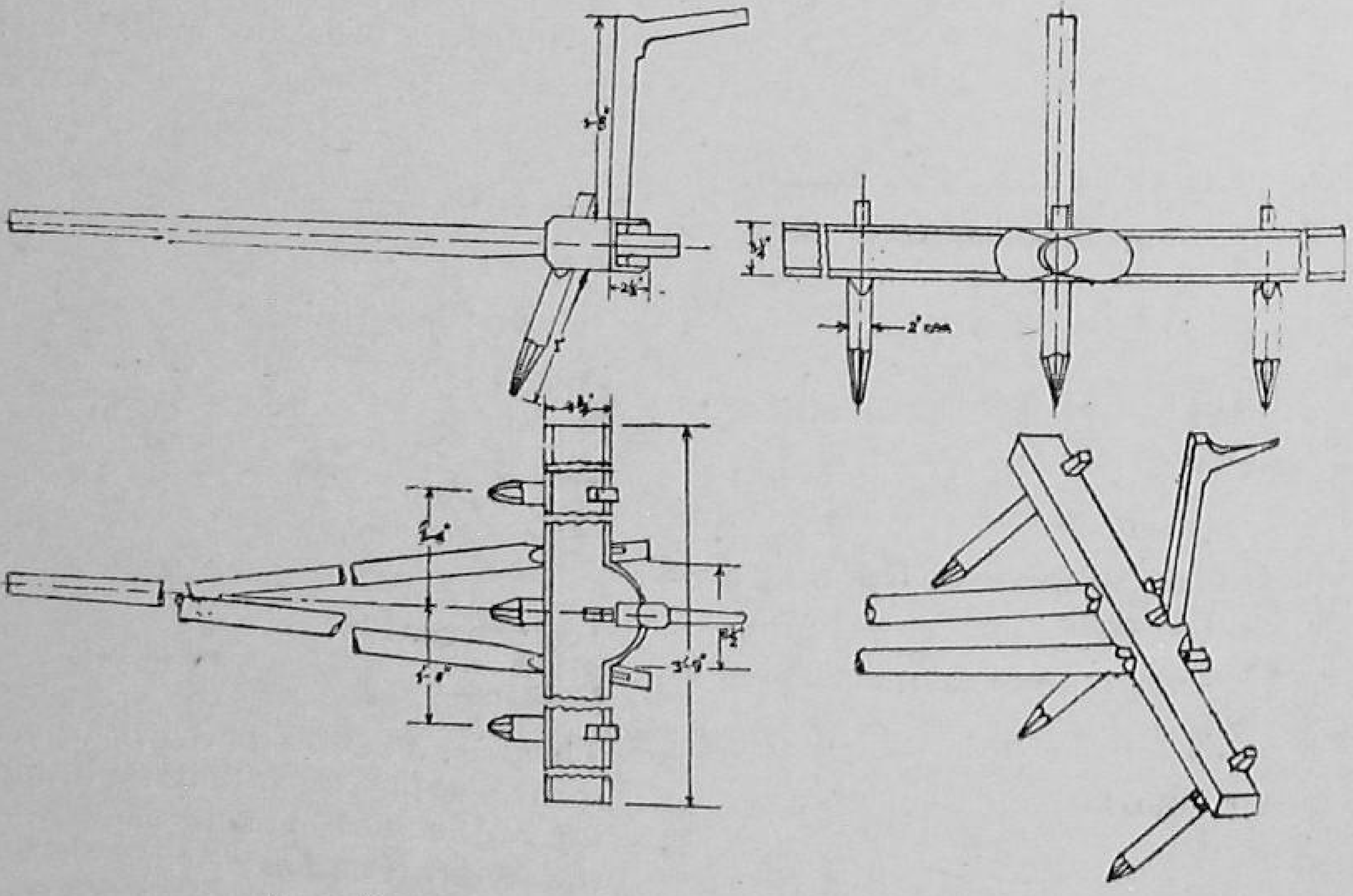
SEED DRILLS

Four-Coultered Drill (Bombay)

1.	Classification	Sowing implement
2.	Name (English and local)	Four-coultered seed drill
3.	Name of the State and District	Bombay—Baroda
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Babul, teak and bamboo
6.	Weight of the implement	60 lb.
	(i) Iron part	—
	(ii) Wooden part	60 lb.
7.	Operating power	One pair of bullocks and five persons
8.	Cost	Rs. 35
9.	Service life	10 years
10.	Usage	For sowing *bajra, jowar* and cotton
11.	Method of application	The beam of this implement is tied to the yoke by means of a rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1.50
14.	Work rate	4 acres per day
15.	Cost of operation per acre	Rs. 1.75
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	There is no device for depth adjustment and for the automatic dropping of the seed. For adjustment of the seed rate one has to depend upon the experience of the man who sows. This drill is used for sowing of cotton by choking the middle coulters.

PLATE 99



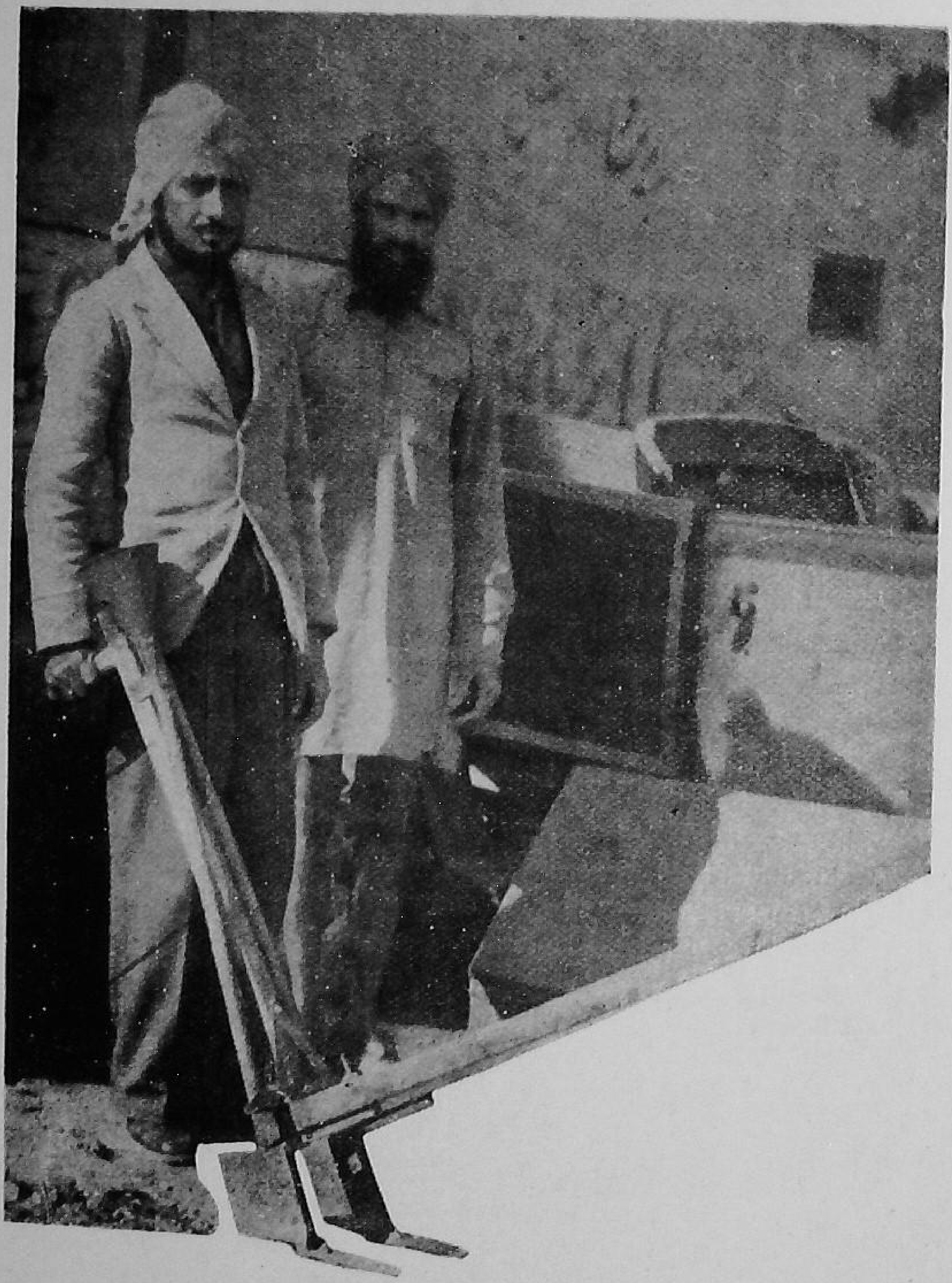


Seed Drill (Nagpur) Madhya Pradesh
(without seed tubes and bowls)

SEED DRILLS

Seed Drill—Argada (Madhya Pradesh)

1.	Classification	Sowing implement
2.	Name (English and local)	Seed drill—Argada
3.	Name of the State and District	Madhya Pradesh—Nagpur
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Babul, Sagwan and bamboo
6.	Weight of the implement	60 lb.
	(i) Iron part	—
	(ii) Wooden part	60 lb.
7.	Operating power	Two bullocks and four men
8.	Cost	Rs. 16
9.	Service life	4 to 5 years
10.	Usage	For sowing of cotton
11.	Method of application	Hitched to the yoke by means of a rope
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	3 acres per day
15.	Cost of operation per acre	Rs. 2.25
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17-	Season of use	Sowing season for cotton
11.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	This seed drill can be used for sowing of most of the *kharif* crops. The depth at which cotton is sown is 3 to 3.25 inches. The spacing between rows is 24 inches. No adjustment is provided to vary the seed rate and spacing.



Two-Pore Hal (Ludhiana) Punjab

SEED DRILLS

Two-Tyned Drill – Two Pore Hal (Punjab)

1.	Classification	Sowing implement
2.	Name (English and local)	Two-tyned seed drill—Two pore hal
3.	Name of the State and District	Punjab—Ferozepur, Ludhiana
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Shisham and Sal wood for beam and handle, iron sheet for seed tube, H.C. Steel for tynes.
6.	Weight of the implement	46 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 20
9.	Service life	—
10.	Usage	For line sowing of maize, wheat and cotton
11.	Method of application	Implement is hitched with a beam to the yoke. The plough man controls the implement and bullocks
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.50
14.	Work rate	2 acres per day
15.	Cost of operation per acre	Rs. 3
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	No specific season
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 25 per cent
20.	Origin	Indian
21.	Remarks	The distance between rows is 8 inches. The average depth at which seeds are sown is 4 inches.

SECTION VI

CLOD CRUSHERS, ROLLERS, LEVELLERS, RIDGERS AND HARVESTING IMPLEMENTS IN USE IN DIFFERENT STATES

CLOD CRUSHERS, ROLLERS, LEVELLERS, RIDGERS AND HARVESTING IMPLEMENTS

During the course of this survey various types of clod crushers, planks, rollers, levellers, ridgers and harvesting implements have come to light.

CLOD CRUSHERS

Clod crushers are used immediately after ploughing and harrowing. The process of crushing clods is by means of heavy wooden logs or planks called *Patas* or *Patelas*. These take the shape of either single logs roughly dressed to rectangular section or two logs attached side by side with a gap in between them (DRG. 64). The double log clod crushers seem to be superior in operation to the single log types. The use of planks seems to be widespread in irrigated agriculture and in paddy areas. In the case of planks used for wetland cultivation two shafts are attached for hitching it to the animal yoke. Under rainfed conditions the plank is directly hitched by ropes to the bullocks for which mild steel rings or eye bolts are usually provided. An interesting variation of plank used in wet cultivation is the hollow plank reported from Madras, Malabar and Vindhya Pradesh (DRG. 65). This facilitates the action of puddling by the swirling motion of water in the hollow portion of the plank. Extra weight is added to all types of planks by persons riding on it.

ROLLERS

The use of rollers is particularly widespread in areas where dry farming is practised in order to compact the seed bed and thereby facilitate the germination of seeds. The usual materials used in construction are wood or stone or concrete. . Coorg has reported a double roller made of wood with serrations on the surface (DRG. 69). Bombay, Madras as well as Coorg have reported some types of rollers on which a man can ride (DRG. 67) for placing additional weight so as to increase the total weight and hence they are more efficent.

LEVELLERS

The major type of leveller consists of logs or planks provided with a handle. The log is pulled by means of shafts attached to it flexibly. With the help of the handle it is possible to alter the working angle so that the soil can be scooped, transported or dumped, at will, over the high and low spots in the field. In irrigated areas the use of light planks with a handle attached to shafts seems to be very popular. The earth scoops or bullock—operated buckscrapers have been reported from Punjab, Madras and Vindhya Pradesh.

One interesting type of leveller-cum-clod crusher is the ladder type leveller made wholly of bamboo or wood reported from West Bengal and Assam (DRG. 66).

RIDGERS

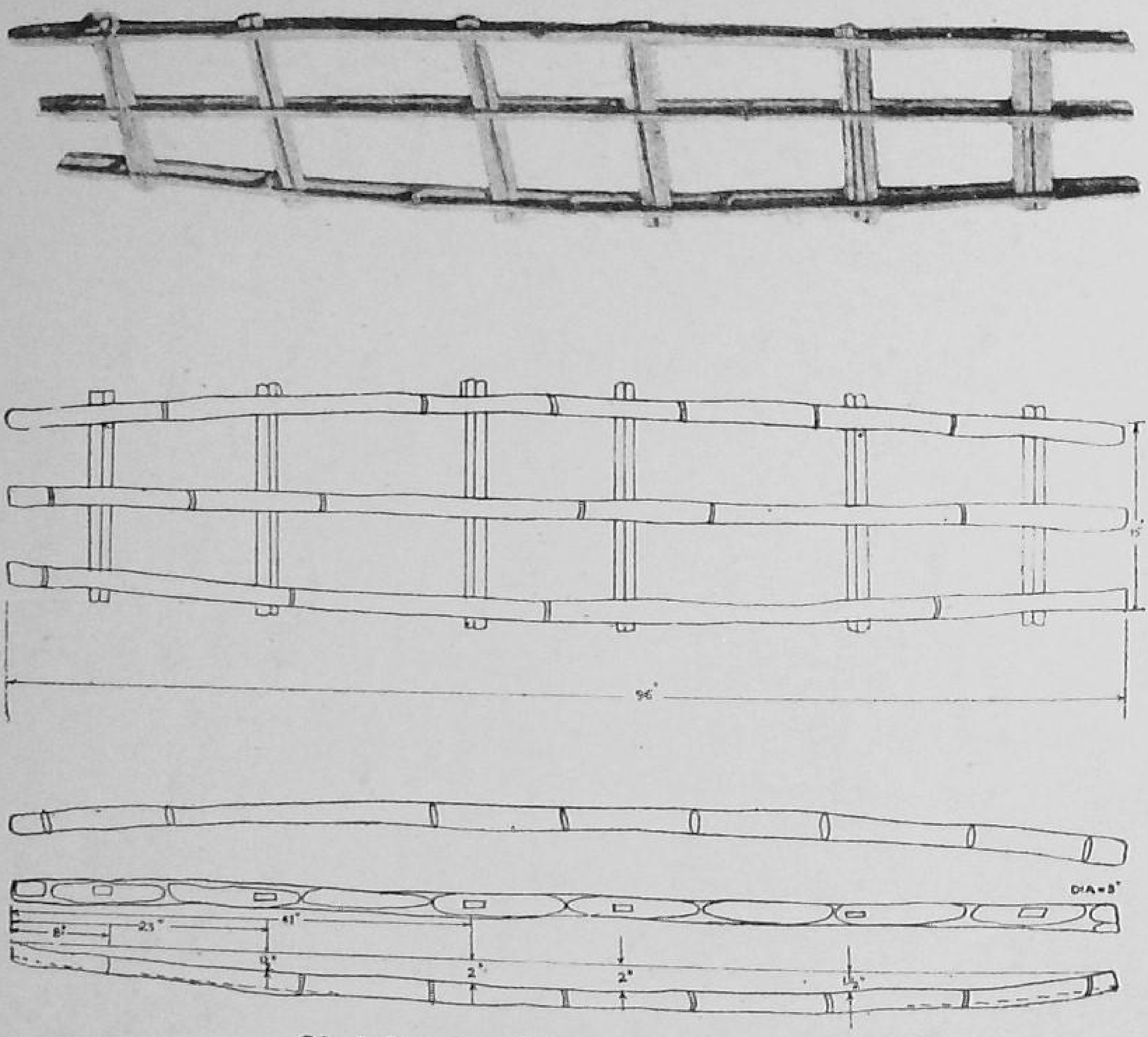
The most common type of ridger is that in which a wooden ridging wing is attached to the ordinary indigenous plough. This type is popular in Uttar Pradesh, Bihar, Orissa, Madhya Bharat and Madras. In parts of the Punjab, the use of a regular iron ridger similar in shape to the lister used in the Western countries is becoming popular. In the light sandy areas of Rajasthan and the Punjab, ridging is accomplished by thickening the rear end of the indigenous plough by winding a rope round it. In West Bengal, an old plough with a worn out shoe and share is often used for preparing the ridges. In Madras, an implement specially designed for forming bunds is in use. Ridgers are also used for making irrigation channels. Besides the bullock drawn ridgers mentioned above hand hoes and spades are widely used for preparing ridges particularly for cultivation of vegetable crops etc., on small plots. The use of hand tools is common in the hilly areas of the Punjab, Himachal Pradesh, Uttar Pradesh, West Bengal, Assam and South India.

HARVESTING IMPLEMENTS

The most common type of harvesting implement is the hand sickle with serrated or plain blade. There are wide varieties of shapes and sizes of sickles in use throughout the country. The differences in shapes and sizes are occasioned by the types of crops to be dealt with.

For harvesting of thick stemmed crops like sugarcane and woody stemmed plants like *arhar*, bill hooks and hand choppers are used. Where the crop is to be cut close to the ground, the handle is offset to the blade. In parts of Madras State, crow bar with flattened cutting edge (DRG. 81) is used for harvesting sugarcane.

PLATE 101



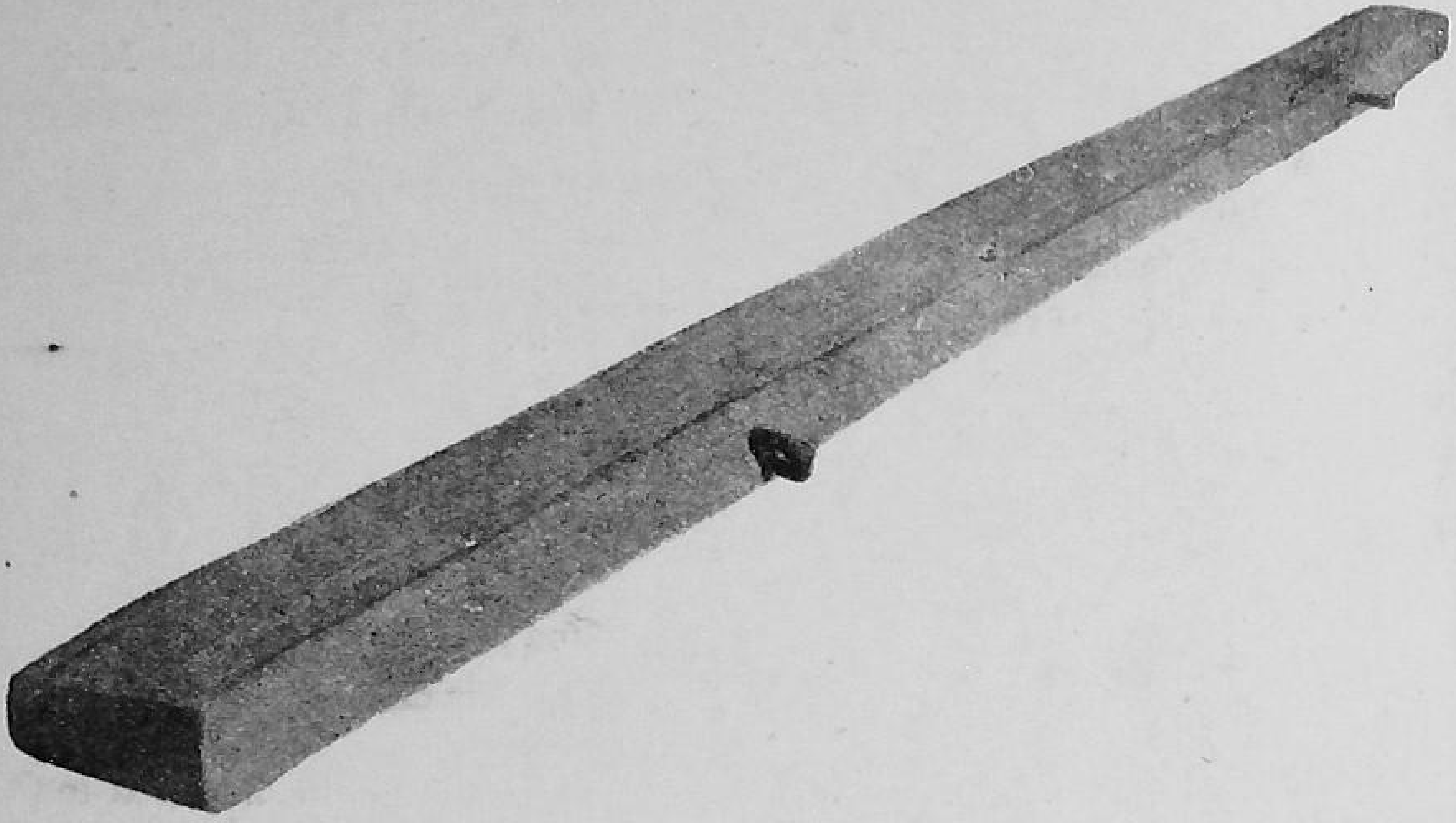
Clod Crusher (Darrang) Assam

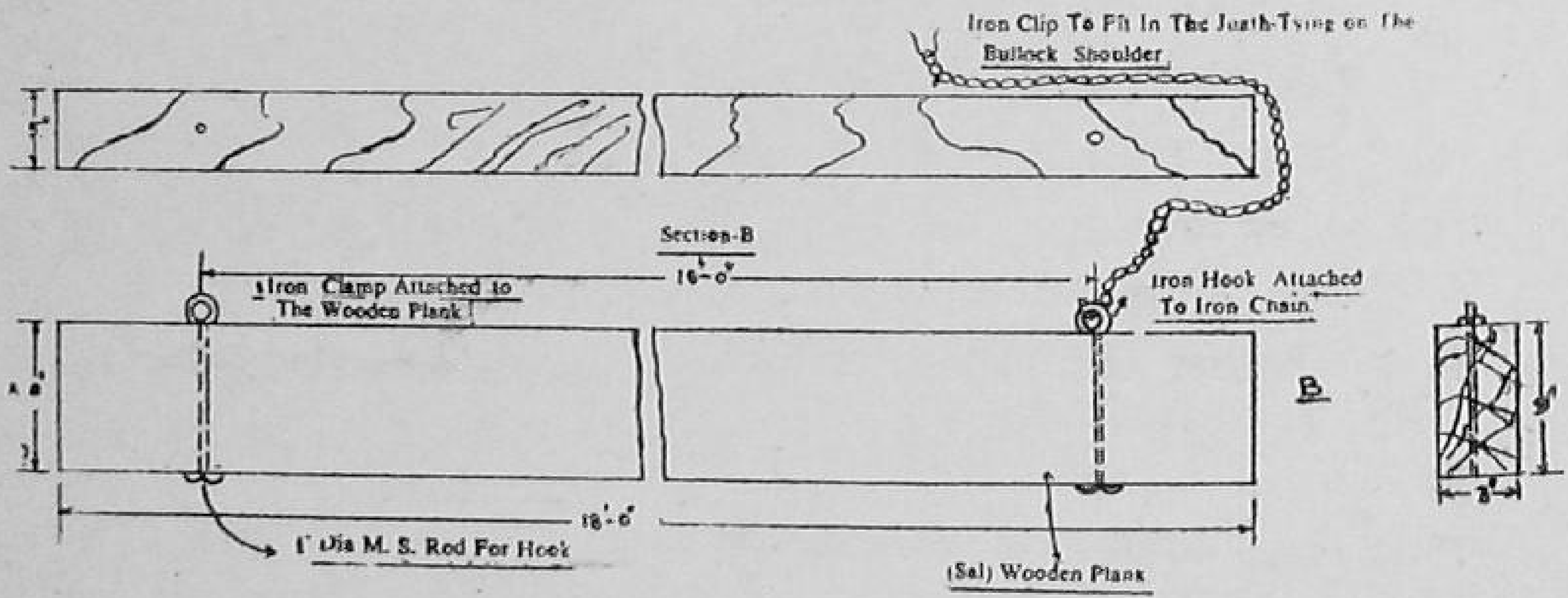
CLOD CRUSHERS

Clod Crusher-cum-Plank – Mai (Assam)

1.	Classification	Land preparation implement
2.	Name (English and local)	Clod crusher-cum-plank—Mai
3.	Name of the State and District	Assam – Darrang
4.	Manufacturers and source of availability	By cultivators
5.	Materials used	Bamboo, cane and jute ropes
6.	Weight of the implement	17 lb.
	(i) Iron part	—
	(ii) Wooden part	17 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 5
9.	Service life	One year
10.	Usage	This implement is used for clod breaking
11.	Method of application	This implement is attached to the yoke by means of a bamboo, cane or ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	—
14.	Work rate	5. 33 acres per day
15.	Cost of operation per acre	—
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
2I.	Remarks	The average draft is about 130 lb. The width of the implement is 8 feet

PLATE 102





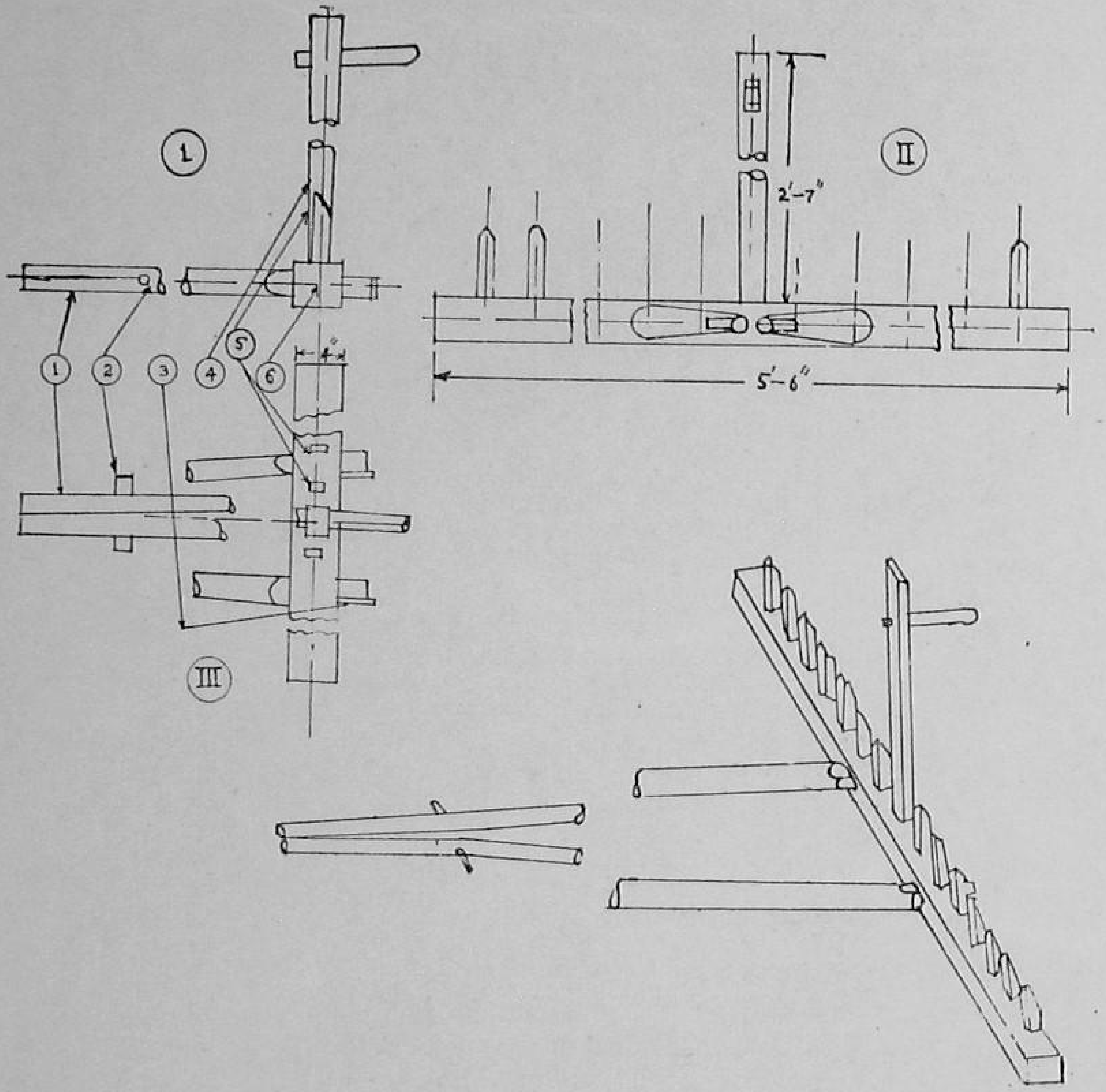
Plank (Shahabad) Bihar

CLOD CRUSHERS

PLANK—HENGI (BIHAR)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plank—Hengi
3.	Name of the State and District	Bihar – Shahabad, Gaya*
4.	Manufacturers and source of availability	Local carpenters
5.	Materials used	Wood (Sakhua) for body and iron for chain and hooks
6.	Weight of the implement	80 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 15 to 16
9.	Service life	4 to 5 years
10.	Usage	Used for breaking clods and planking the fields after ploughing
11.	Method of application	The implement is connected to the yoke by means of chains. One man stands on the plank and controls the bullocks and implement
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.25 to 0.75
14.	Work rate	1.5 to 2 acres per day
15.	Cost of operation per acre	Rs. 2
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 75 per cent
20.	Origin	Indian
21.	Remarks	The heavier types of plank need two pairs of bullocks

* An identical type of plank has been reported from the following Districts. : (1) Broach District of Bombay State ; (2) Farrukhabad and Agra of U.P. ; (3) Mandi and Chamba Districts of Himachal Pradesh ; (4) Mandla Districts of Madhya Pradesh ; (5) Gwalior, Jhabua Districts of Madhya Bharat ; (6) Bundi, Chittorgarh, Tonk, Udaipur Bharatpur, Jhalawar, Alwar, Sawai Madhopur of Rajasthan ; and (7) almost all the Districts of the Punjab.

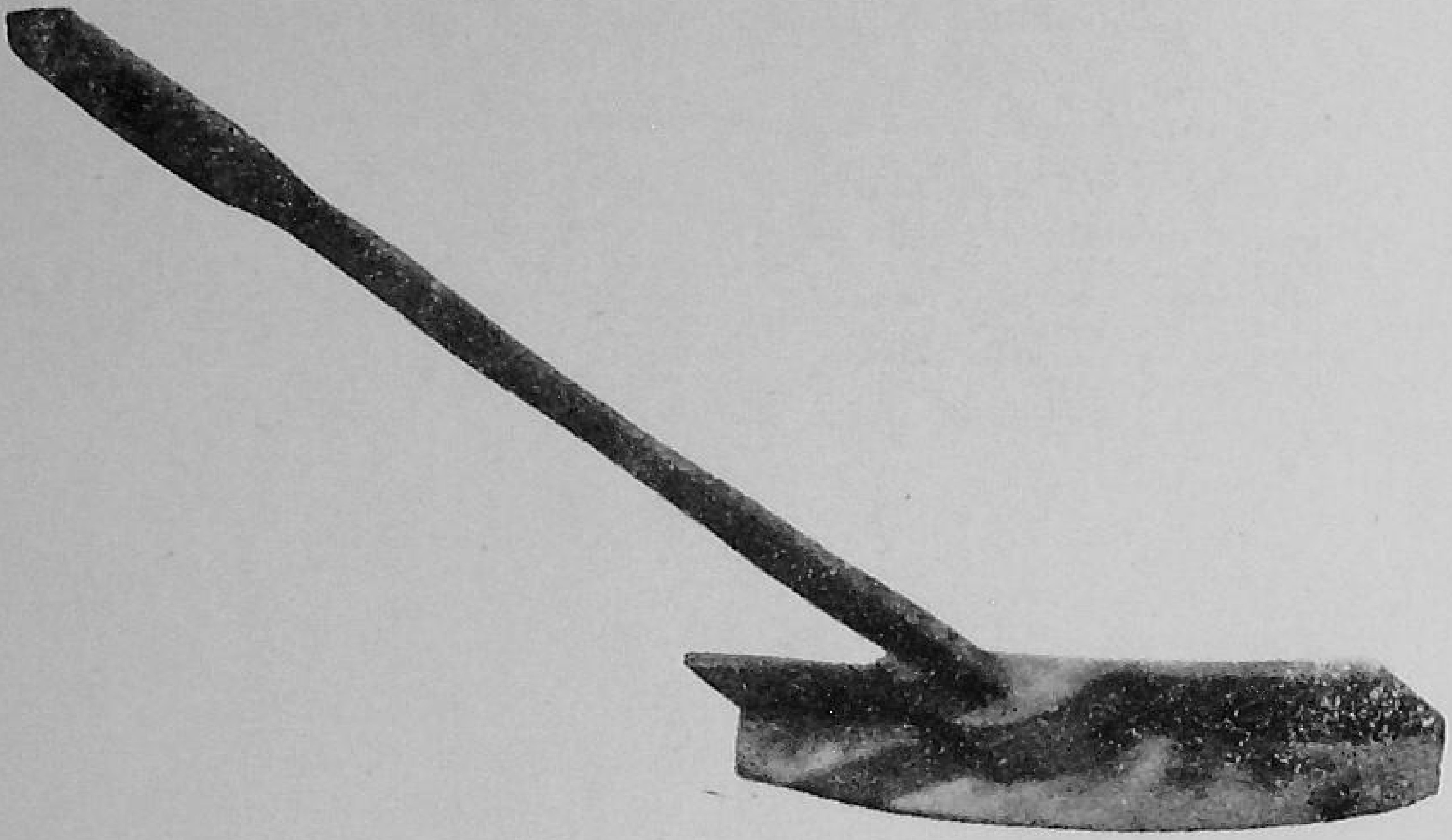


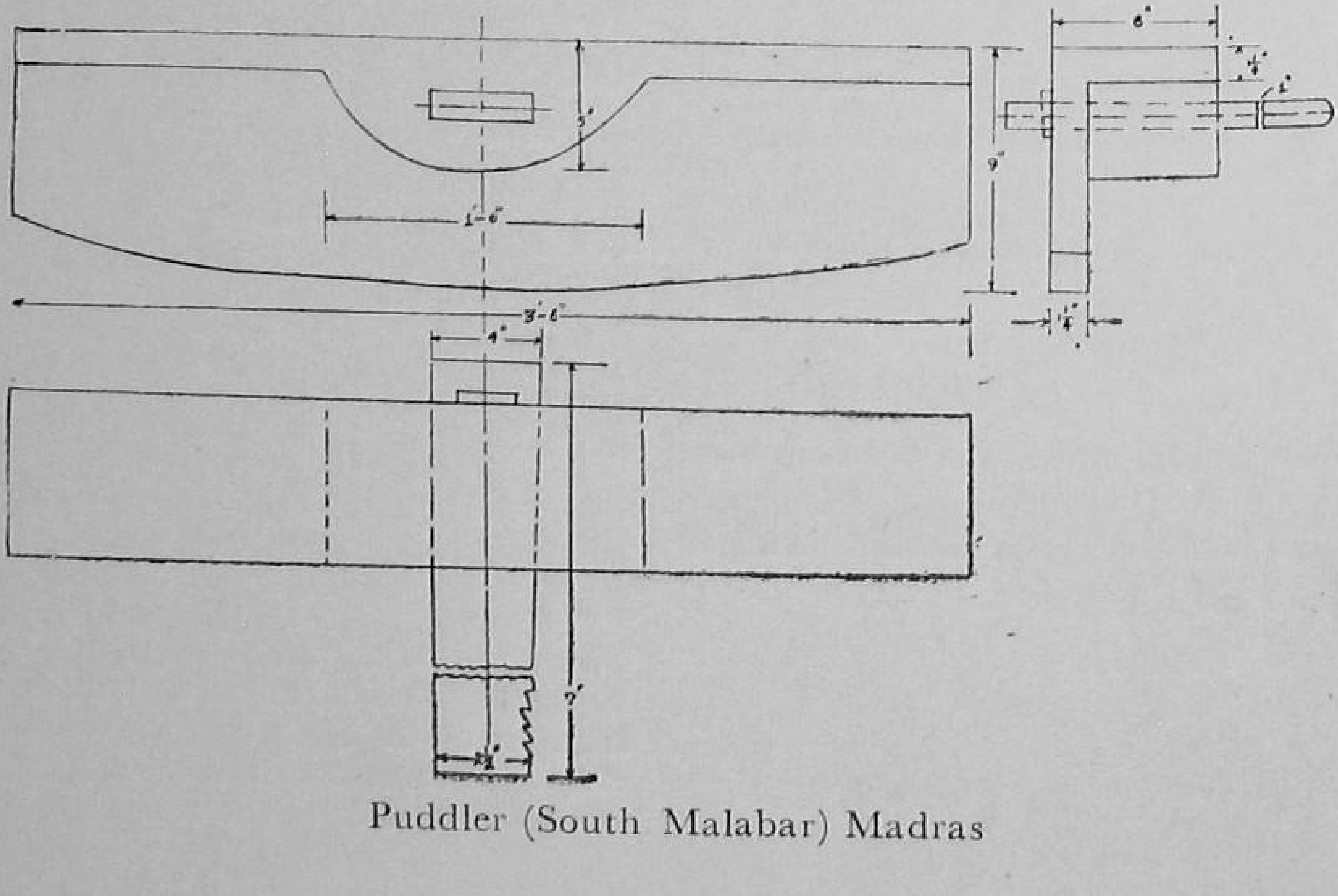
Plank-cum-Puddling Harrow (Jabalpur) Madhya Pradesh

CLOD CRUSHERS

Plank-cum-Puddling Harrow—Patha (Madhya Pradesh)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plank-cum-puddling Harrow—Patha
3.	Name of the State and District	Madhya Pradesh—Jabalpur
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Babul, Tendu, Tinsa and Sagwan
6.	Weight of the implement	68 lb.
	(i) Iron part	—
	(ii) Wooden part	68 lb.
7.	Operating power	Two bullocks and one person
8.	Cost	Rs. 4 to 6
9.	Service life	3 to 4 years
10.	Usage	It is used for clod crushing and planking after ploughing
11.	Method of application	The implement is connected to the yoke by means of the beam as in a plough and is driven by two bullocks
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.50 to 1.00
14.	Work rate	4 acres per day
15.	Cost of operation per acre	Re. 1
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	This is not a separate implement by itself. It is a Datari or puddler invented so that the peg side is up and the smooth side moves along the surface of the soil.



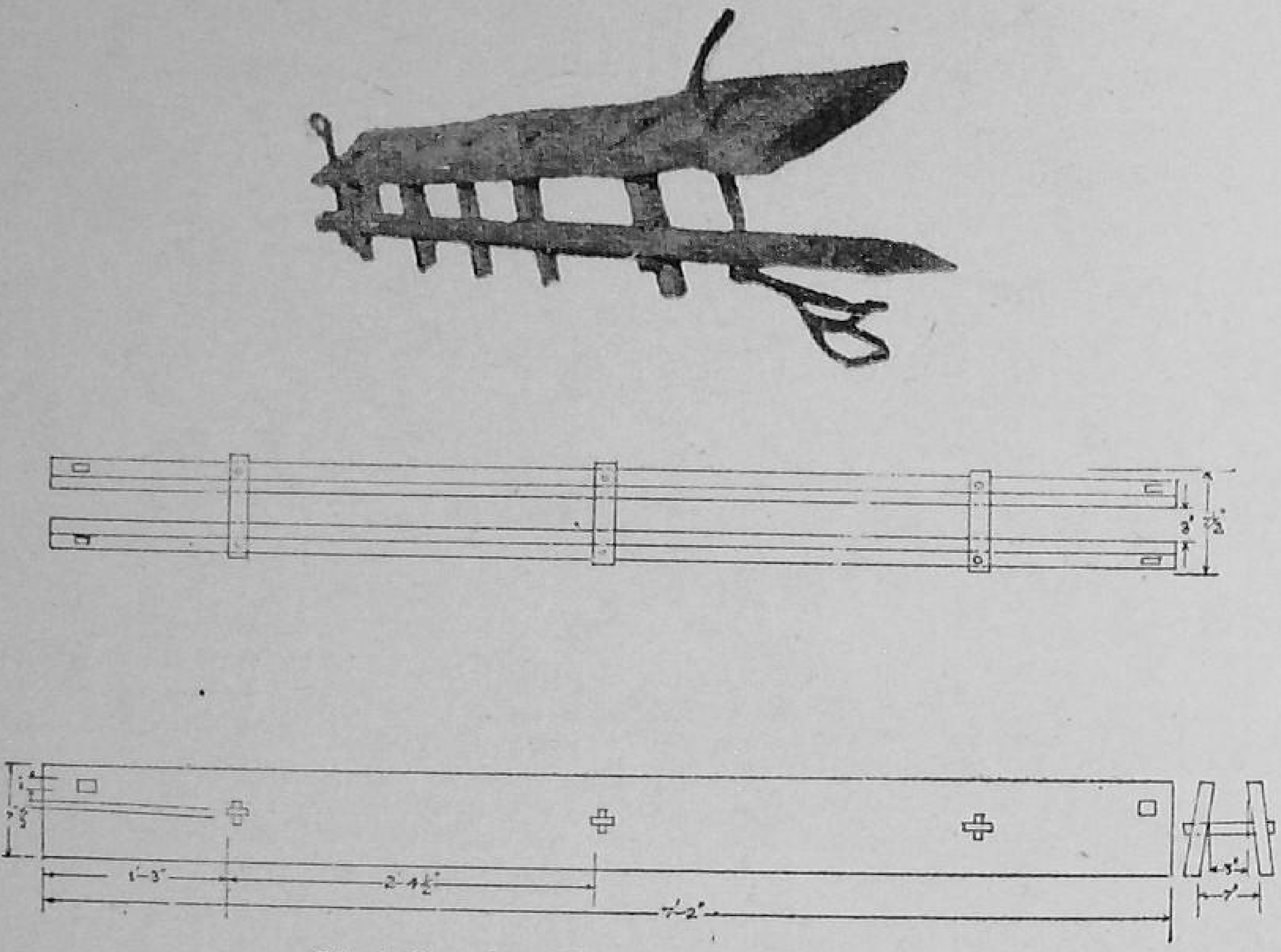


Puddler (South Malabar) Madras

PUDDLERS

Puddler—Chivittu Maram (Madras)

1.	Classification	Land preparation implement
?.	Name (English and local)	Puddler—Chivittu Maram
3	Name of the State and District	Madras—South Malabar
4.	Manufacturers and source of availability	Villlage craftsman
5.	Materials used	Teak wood
6.	Weight of the implement	15 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 5 to 7
9.	Service life	6 years
10.	Usage	It is used in a ploughed field under water to do puddling. And is used two to three times in the same field.
11.	Method of application	The implement is connected to the yoke by means of the beam and is drawn by a pair of bullocks
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.50 to 0.75
14.	Work rate	1 acre per day
15.	Cost of operation per acre	Rs 8 to 9
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	50 to 60 per cant
20.	Origin	Indian
21.	Remarks	The puddling board is used twice in the same field. An identical type of leveller has been reported from Surguja District of Madhya Pradesh



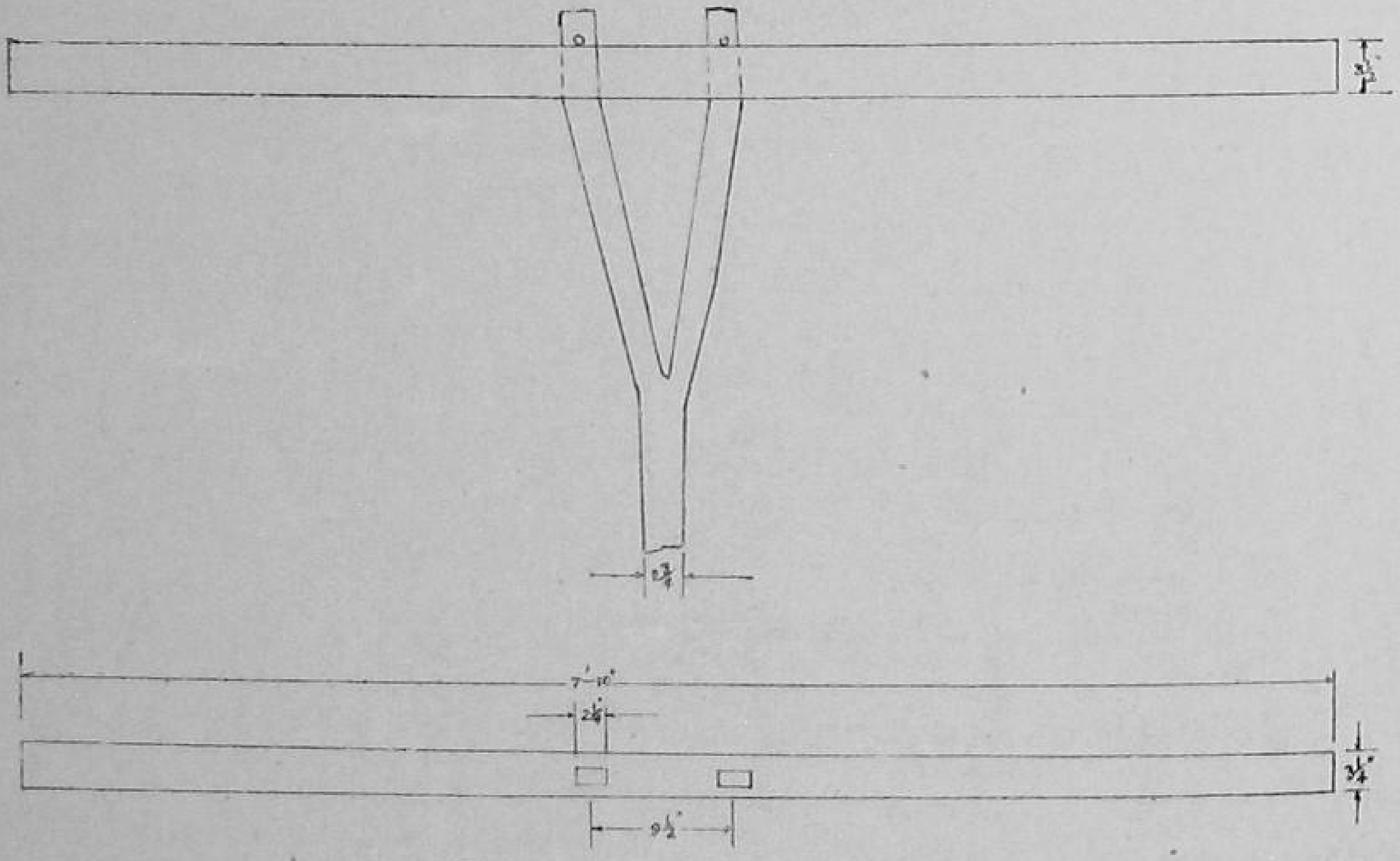
Clod Crusher (Mayurbhanj) Orissa

CLOD CRUSHERS

CLOD CRUSHER—MAI (ORISSA)

1.	Classification	Land preparation implement
2.	Name (English and local)	Clod crusher—Mai
3.	Name of the State and District	Orissa—Mayurbhanj
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Sal wood
6.	Weight of the implement	51.5 lb.
	(i) Iron part	—
	(ii) Wooden part	51.5 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 8 to 9
9.	Service life	2 to 3 years
10.	Usage	It is used for clod crushing and pulverizing the soil
11.	Method of application	The implement is hitched to the yoke by means of ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	2 to 3 acres per day
15.	Cost of operation per acre	Re. 0.75 to 1.00
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	With this type of clod crusher better work is obtained

PLATE 106



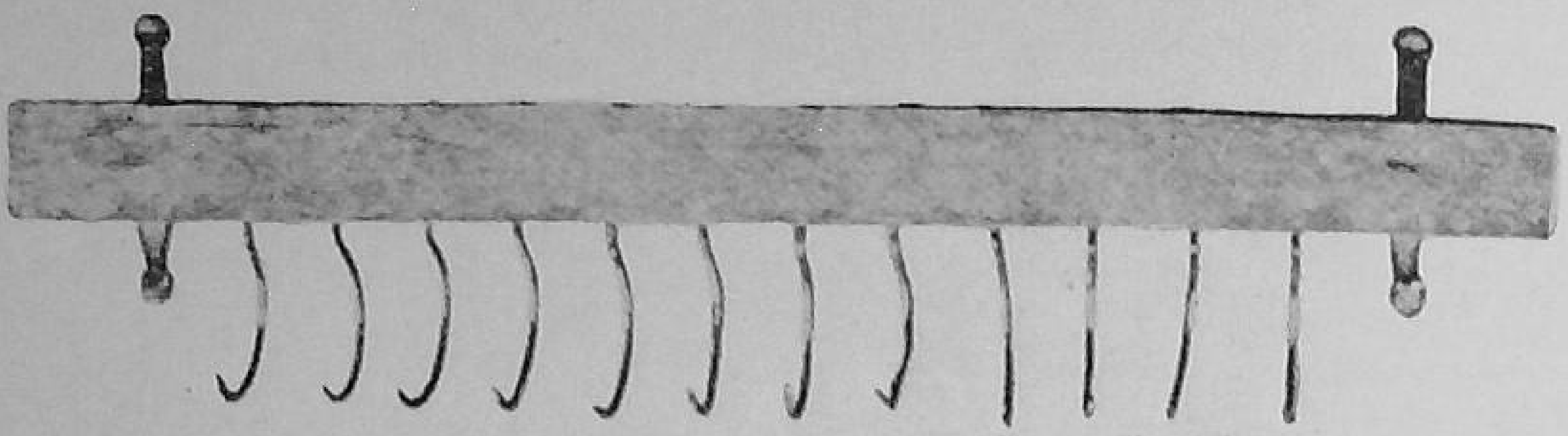
Plank (Sambalpur) Orissa

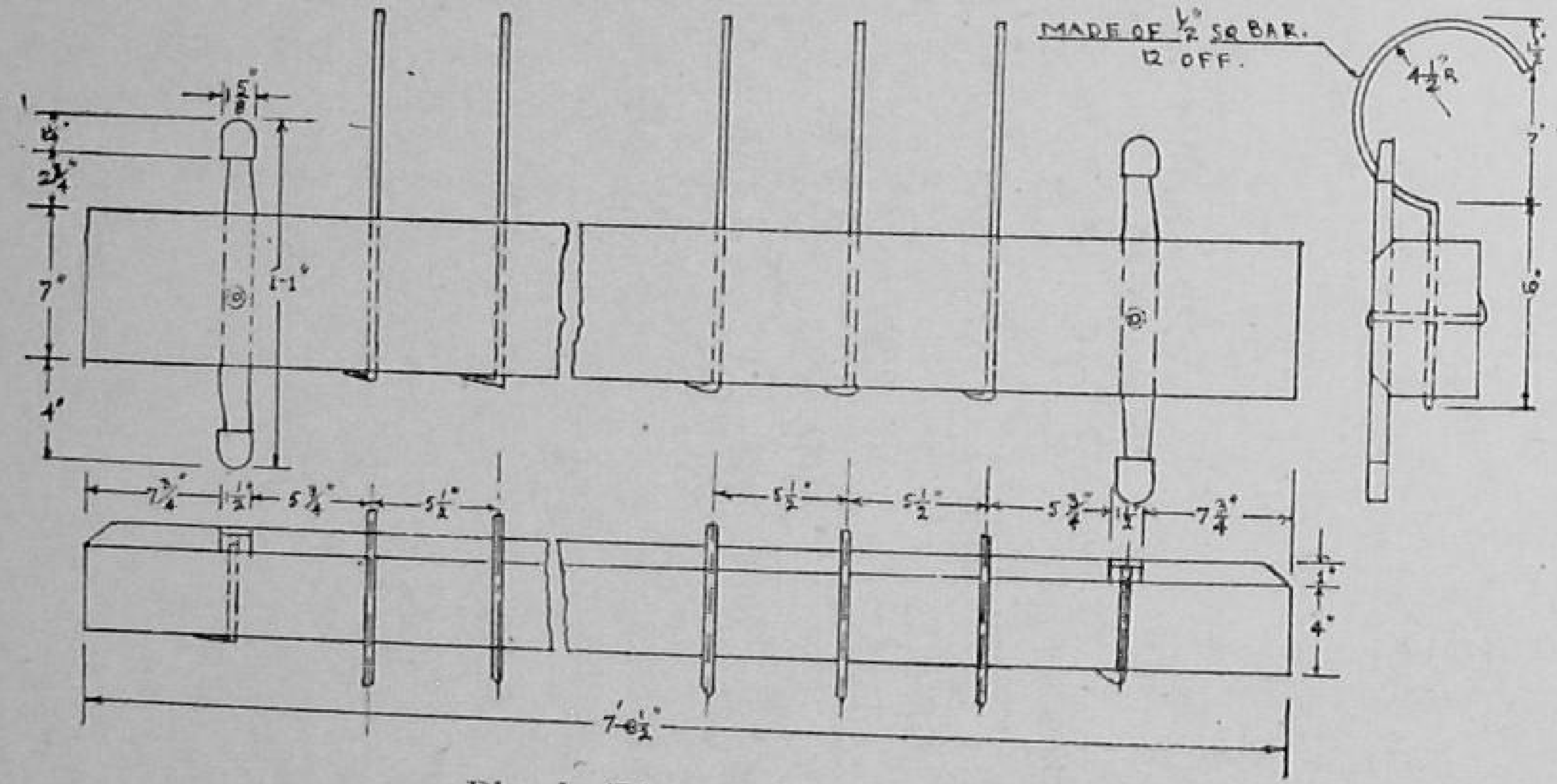
CLOD CRUSHERS

Plank—Mai (Orissa)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plank—Mai
3.	Name of the State and District	Orissa—Sambalpur*
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Babul and Kendu
6.	Weight of the implement	35 lb.
	(i) Iron part	—
	(ii) Wooden part	35 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 7 to 8
9.	Service life	2 to 3 years
10.	Usage	It is used for clod breaking and planking after ploughing the fields
11.	Method of application	The implement is hitched to the yoke by means of beam and a rope.
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	2 to 2.6 acres per day
15.	Cost of operation per acre	About Re. 1
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	This plank is in one piece, rectangular in cross section with a beam attached in the middle. Some times two separate beams are attached.

* An identical type of plank has been reported from the following areas: (1) Raipur District of Madhya Pradesh; and (3) nearly all over Vindhya Pradesh except some localities of Sidhi and Sahdol Districts.



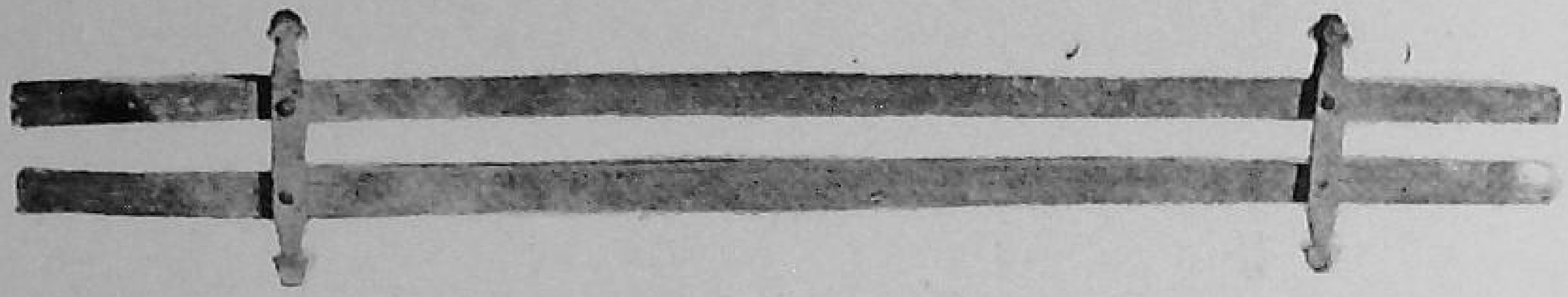


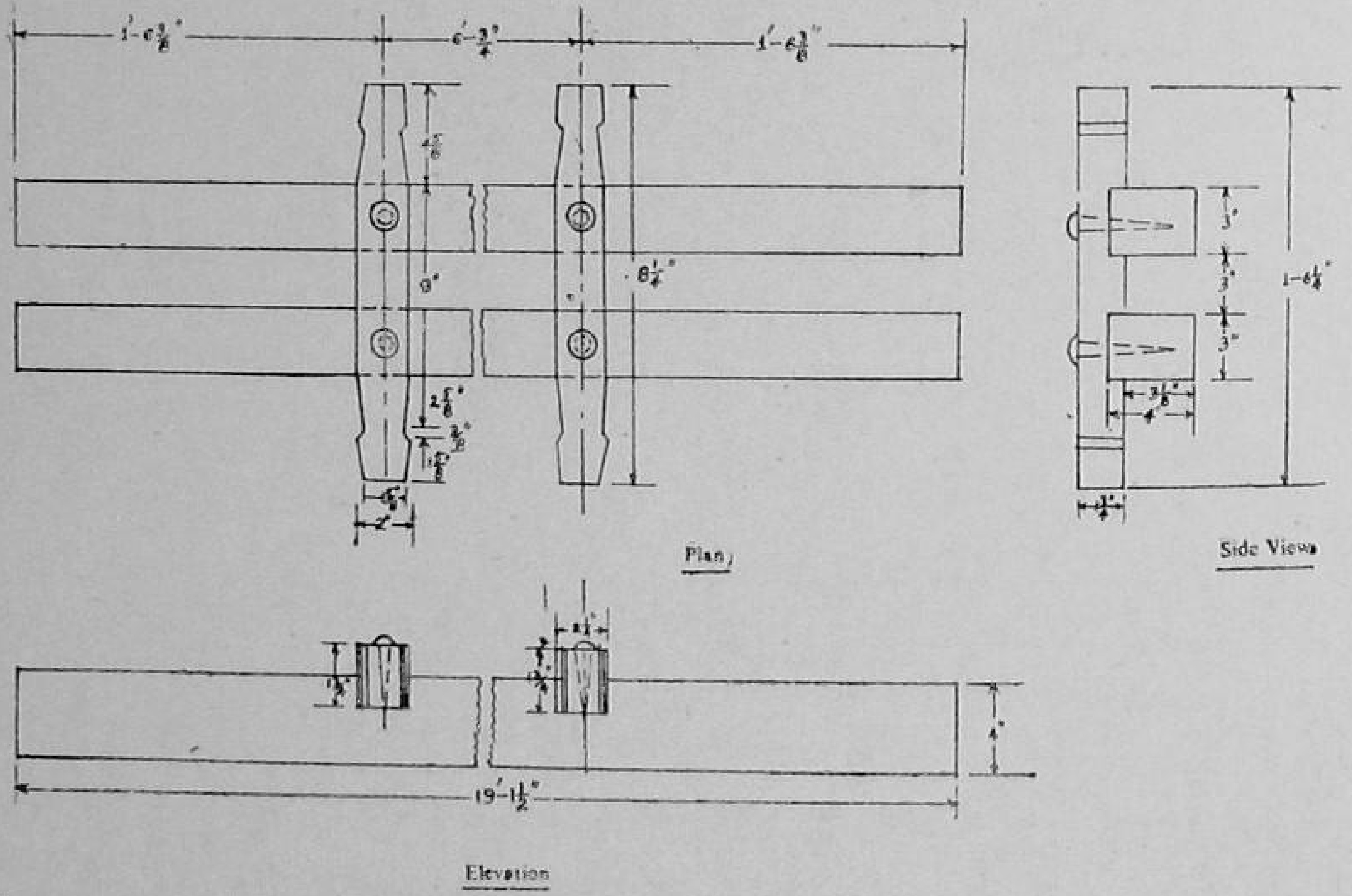
Plank (Kanpur) Uttar Pradesh

CLOD CRUSHERS

PLANK—KATIA PATA (UTTAR PRADESH)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plank—Katia Pata
3.	Name of the State and District	Uttar Pradesh – Kanpur
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Wood for plank and iron for weeding hooks
6.	Weight of the implement	80 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 18
9.	Service life	6 years
10.	Usage	It is used for planking, clod crushing and collecting weeds by the weeding hooks.
11.	Method of application	The plank is hitched to the yoke by tying two wooden pegs provided on the implement by means of ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 1
14.	Work rate	4 acres per day
15.	Cost of operation per acre	Rs. 1.75
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 50 per cent
20.	Origin	Indian
21.	Remarks	This plank has weeding hooks made of iron and fitted to one side of the plank by which weeds are collected.



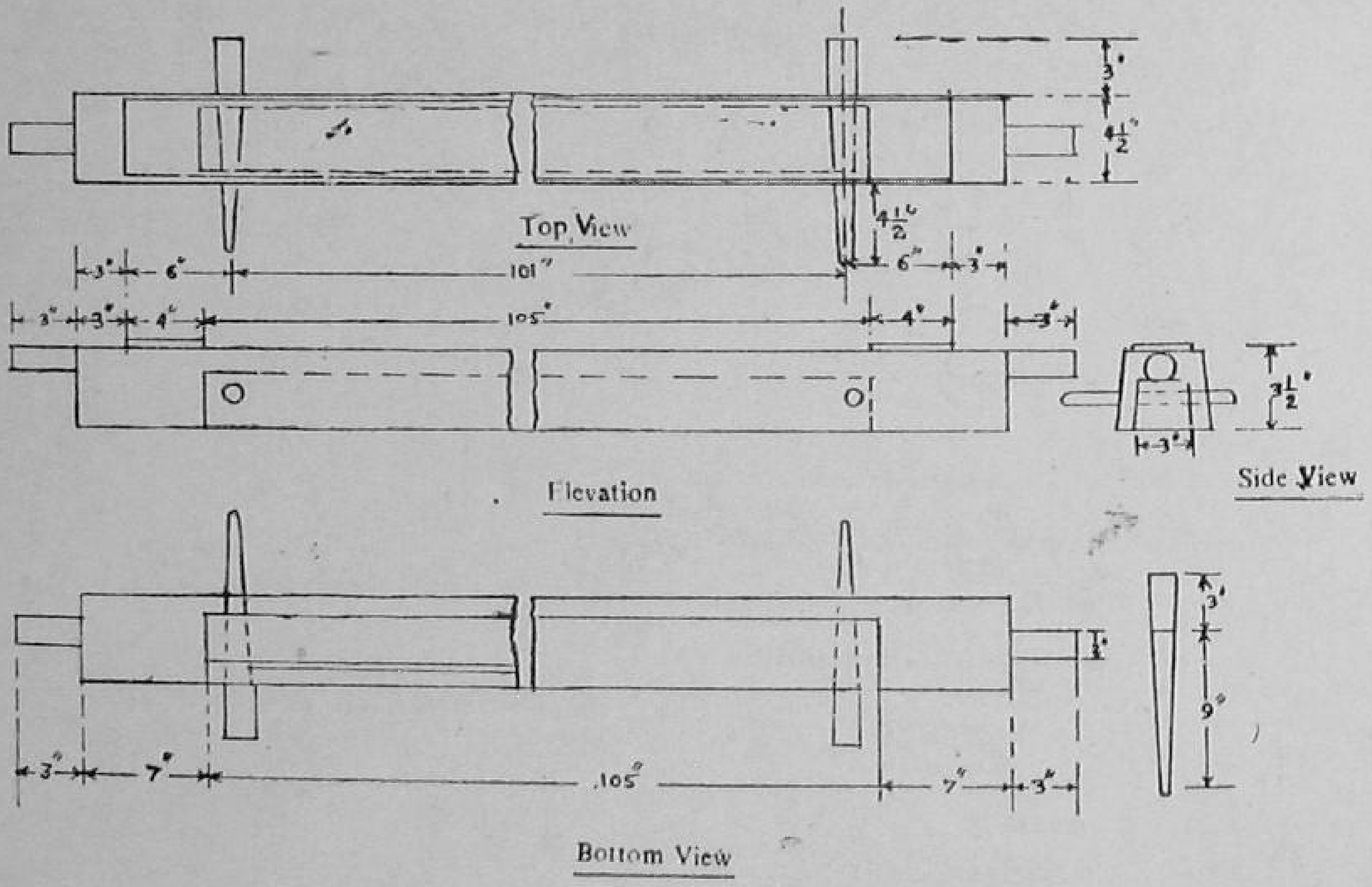


Plank (Barielly) Uttar Pradesh

CLOD CRUSHERS

PLANK—PATELA (UTTAR PRADESH)

1. Classification	Land preparation implement
2. Name (English and local)	Plank– Patela
3. Name of the State and District	U.P.—Barielly, Moradabad
4. Manufacturers and source of availability	Village artisans
5. Materials used	Shisham and Babul wood
6. Weight of implement	80 lb.
(i) Iron part	—
(ii) Wooden part	80 lb.
7. Operating power	Two bullocks and one man
8. Cost	Rs. 10 to 20
9. Service life	5 to 8 years
10. Usage	It is used for planking and clod crushing after plouhing
11. Method of application	The plank is hitched to the yoke by means of ropes.
12. Repaired locally or otherwise	Locally
13. Annual maintenance charges	Re. 0.50
14. Work rate	4 acres per day
15. Cost of operation per acre	Rs. 1.75
16. Whether all purpose or used for specific purpose	As per remarks under usage
17. Season of use	Year round
18. Total number of working days in a year	—
19. Percentage of farmers using it	About 100 per cent
20. Origin	Indian
21. Remarks	An identical type of plank is being used in most of the Districts of the Punjab



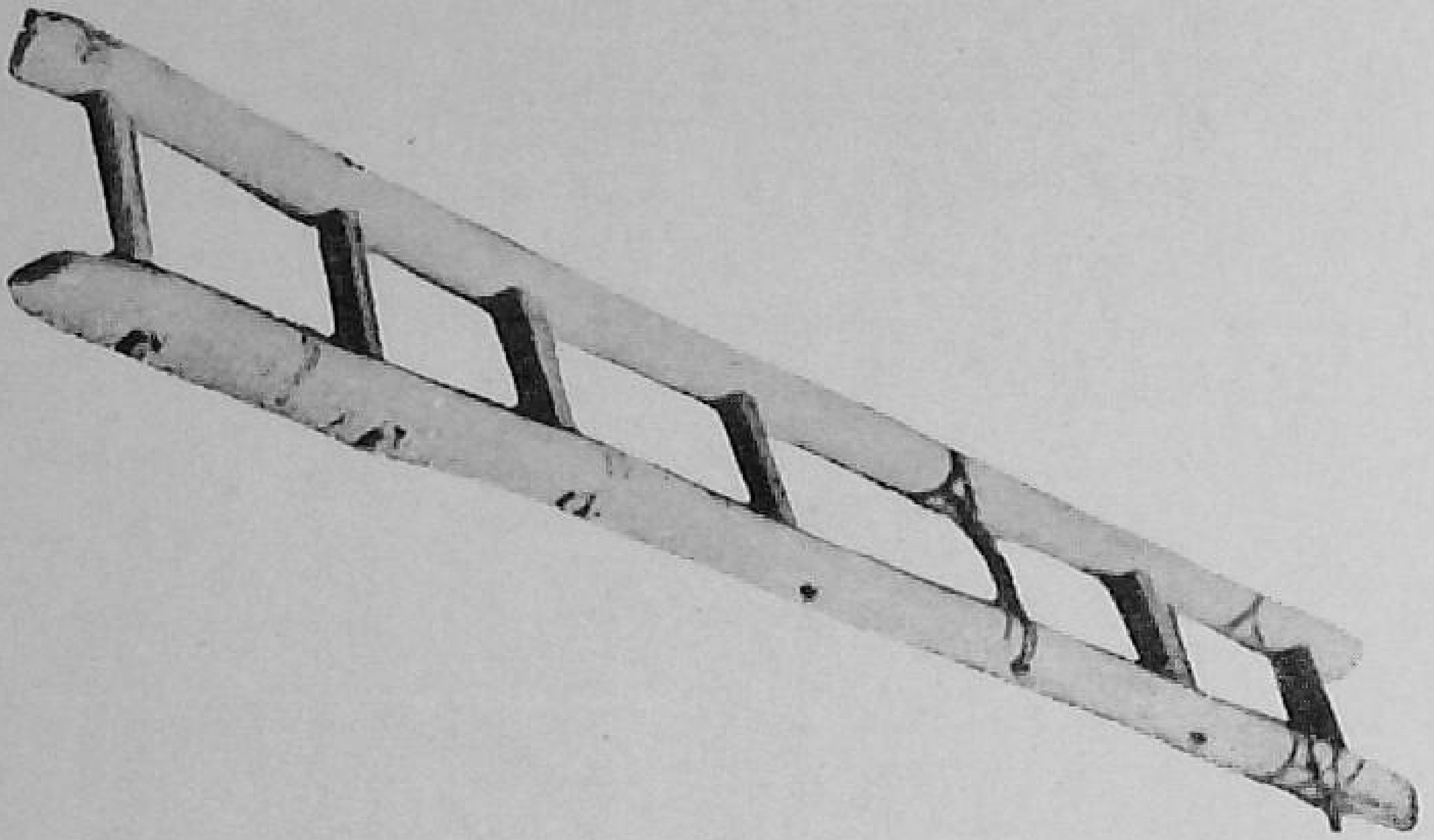
Plank—Vindhya Pradesh

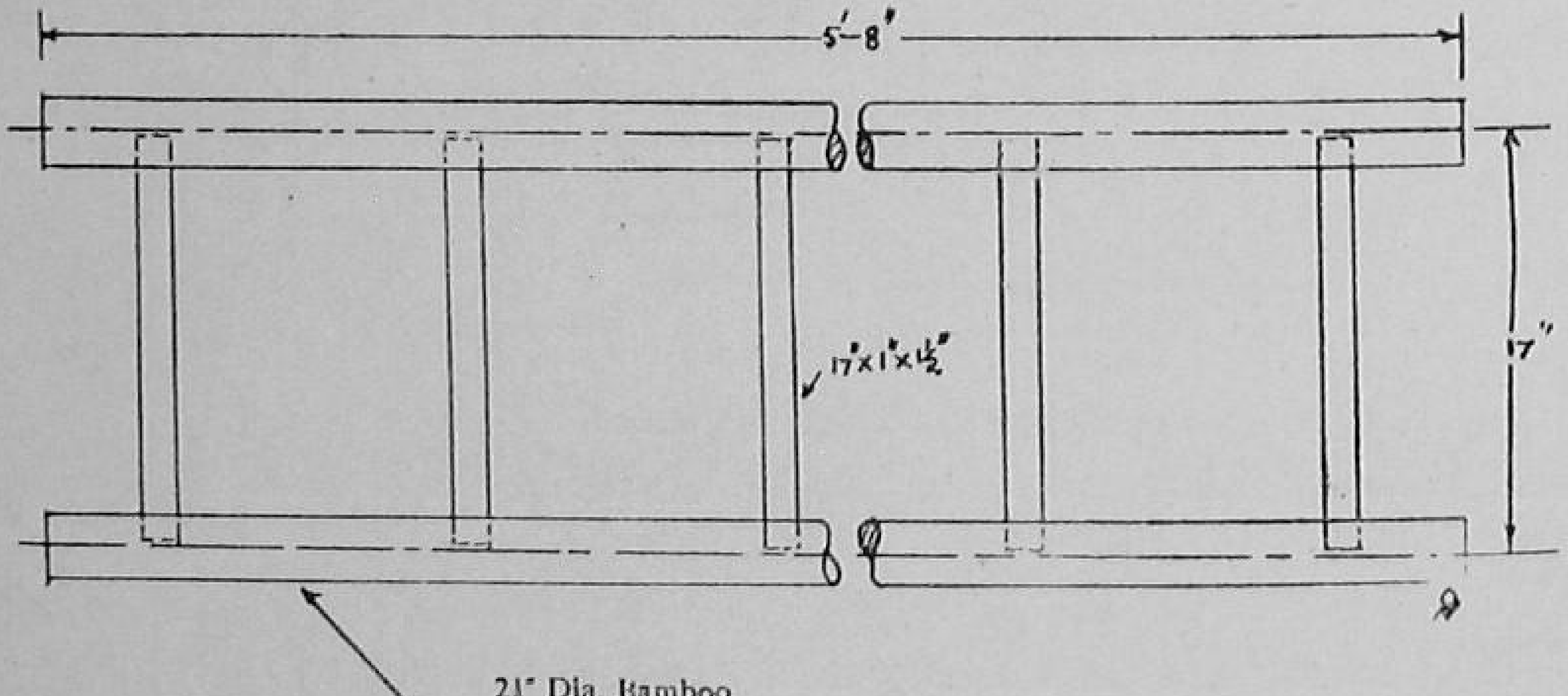
CLOD CRUSHERS

PLANK—KOPAR, PAHATA AND MAI (VINDHYA PRADESH)

1.	Classification	Land preparation implement
2.	Name (English and local)	Plank—Kopar, Pahata and Mai
3.	Name of the State and District	Vindhya Pradesh—All through the State except some localities in Sidhi and Shahdol Districts
4.	Manufacturers and source of availability	Village carpenter
5.	Materials used	Wood
6.	Weight of the implement	50 to 120 lb.
	(i) Iron part	—
	(ii) Wooden part	50 to 120 lb.
7.	Operating power	Four bullocks and two men
8.	Cost	Rs. 5 to 10
9.	Service life	2 years
10.	Usage	Used for levelling the ploughed land breaking the clods thereby pulverizing the soil and covering the seeds after sowing of *kharif* crops.
11.	Method of application	Implement is connected to the yoke by means of ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 1
14.	Work rate	3 to 4 acres per day (Planking)
15.	Cost of operation per acre	Rs. 1.75
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	The implement varies in size from place to place.

PLATE 110



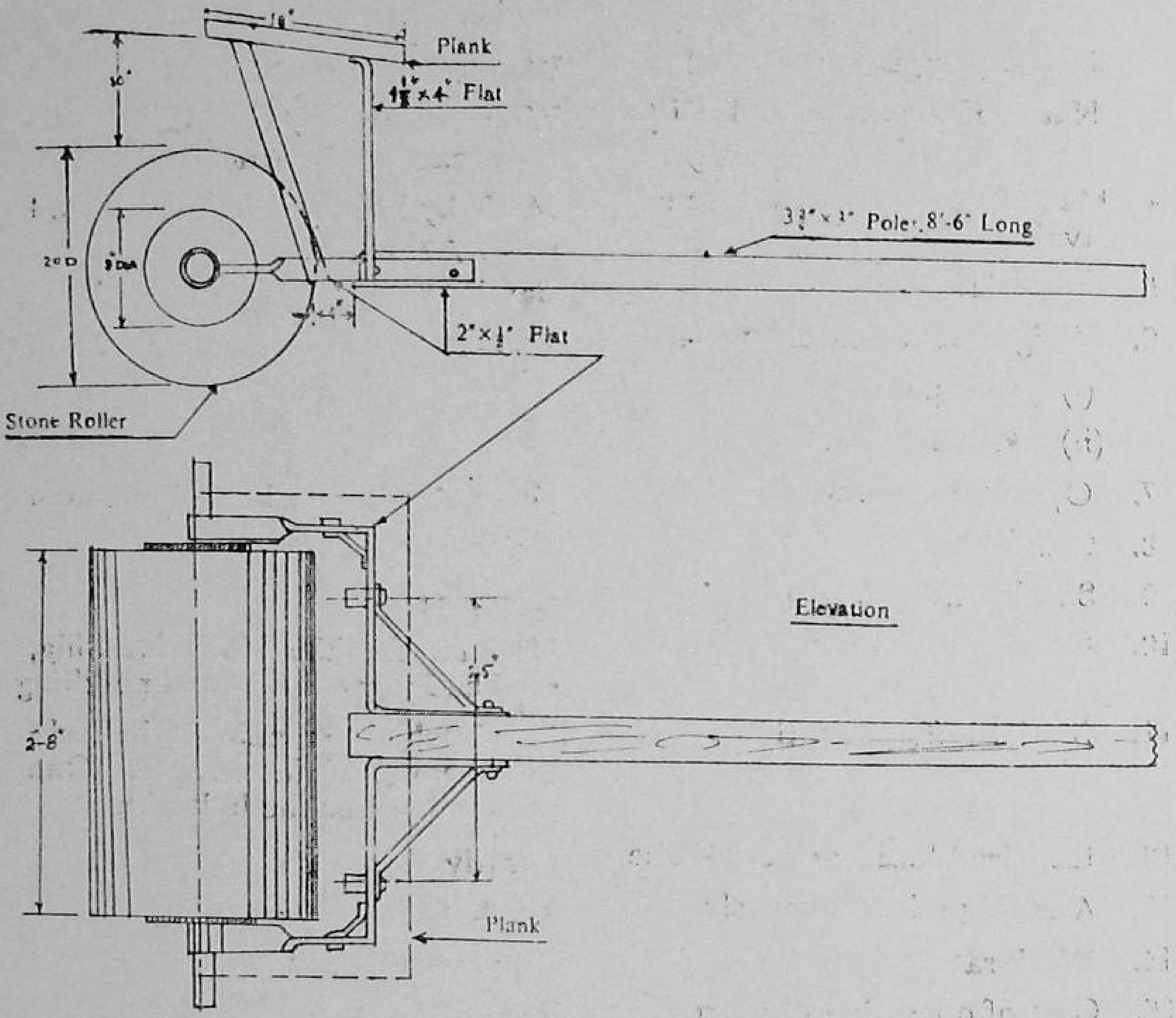


Wooden Ladder—West Bengal

CLOD CRUSHERS

Wooden Ladder—Mai (West Bengal)

1.	Classification	Land preparation implement—clod crusher
2.	Name (English and local)	Wooden ladder—Mai
3.	Name of the State and District	West Bengal—Throughout the State except hill regions
4	Manufacturers and source of availability	Made by farmers themselves and also by village artisans
5.	Materials used	Bamboo
6.	Weight of the implement	10 to 18 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 2 to 5
9.	Service life	One year
10.	Usage	Used for breaking clods, levelling, seed bed preparation and puddling
11.	Method of application	It is hitched to a pair of bullocks by means of jute ropes. One person controls the bullocks.
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.25
14.	Work rate	One acre per day
15.	Cost of operation per acre	Rs. 5.25
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	As the implement is very light in weight it is not so effective in breaking clods. It is quite useful for puddling the fields. A similar type of plank has also been reported fiom Cuttack District of Orissa and Darrang District of Assam.



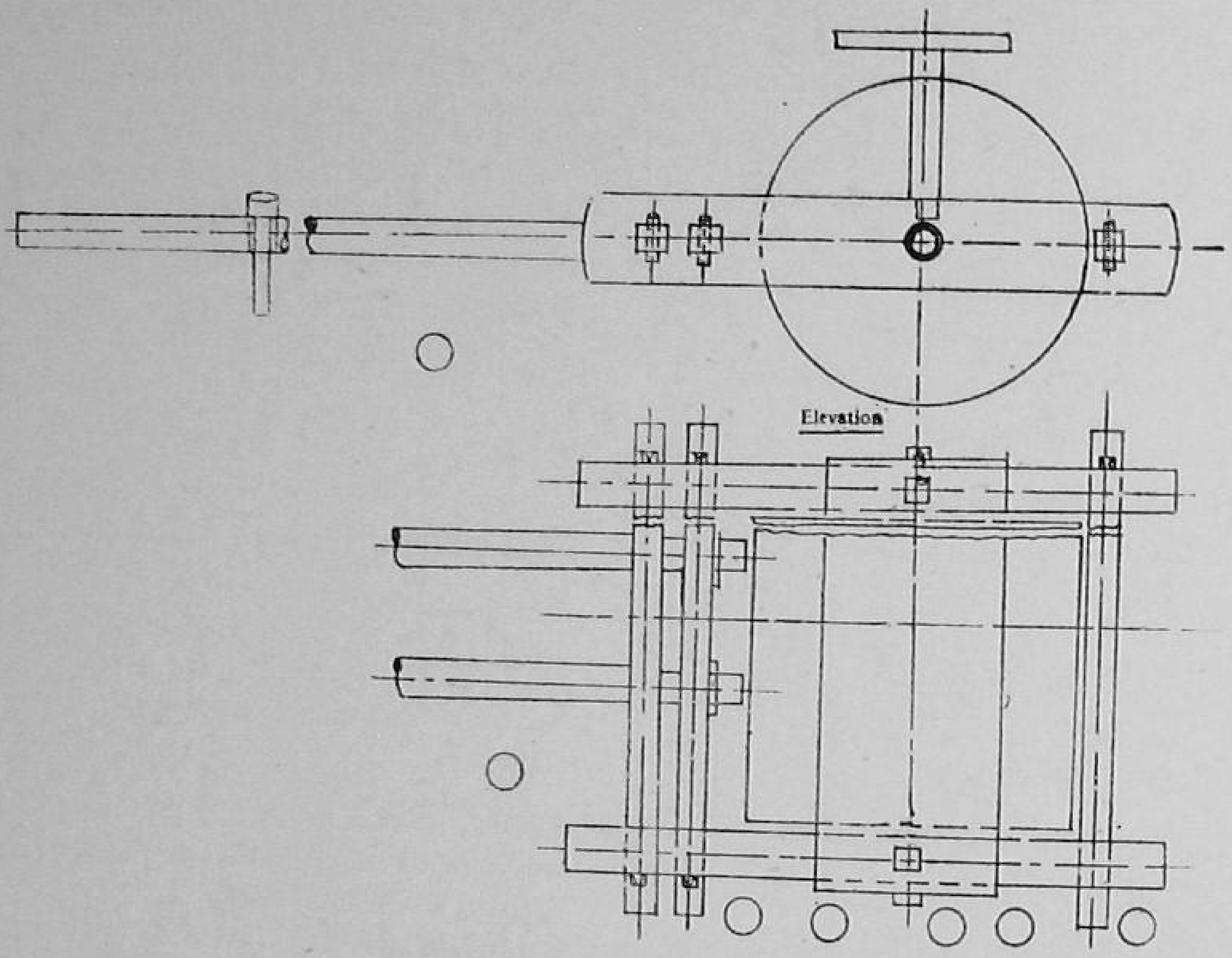
Stone Roller—Bombay

ROLLERS

Stone Roller (Bombay)

1.	Classification	Threshing implement
2.	Name (English and local)	Stone roller
3.	Name of the State and District	Bombay—Dharwar, Belgaum, Bijapur
4.	Manufacturers and source of availability	Superintendant Agricultural School, Arbani, District Belgaum
5.	Materials used	Stone for roller, iron for axle and wood for beam
6.	Weight of the implement	2240 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One pair of bullocks and two men
8.	Cost	Rs. 40
9.	Service life	20 years
10.	Usage	Used for threshing *jowar* (ear-heads)
11.	Method of application	The roller is hitched to the yoke by means of the beam and then drawn over the heap of ear-heads of *jowar* spread in the threshing yard
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	—
15.	Cost of operation per acre	—
16	Whether all purpose or used for specific purpose	Used only for threshing of ear-heads of *jowar*
17.	Season of use	Harvesting time of *jowar*
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	It is getting popular in Karnatak Districts
20.	Origin	Evolved in the State
21.	Remarks	As compared to the indigenous method of threshing under the feet of bullocks, the stone roller gives at least 8 times more output

PLATE 112



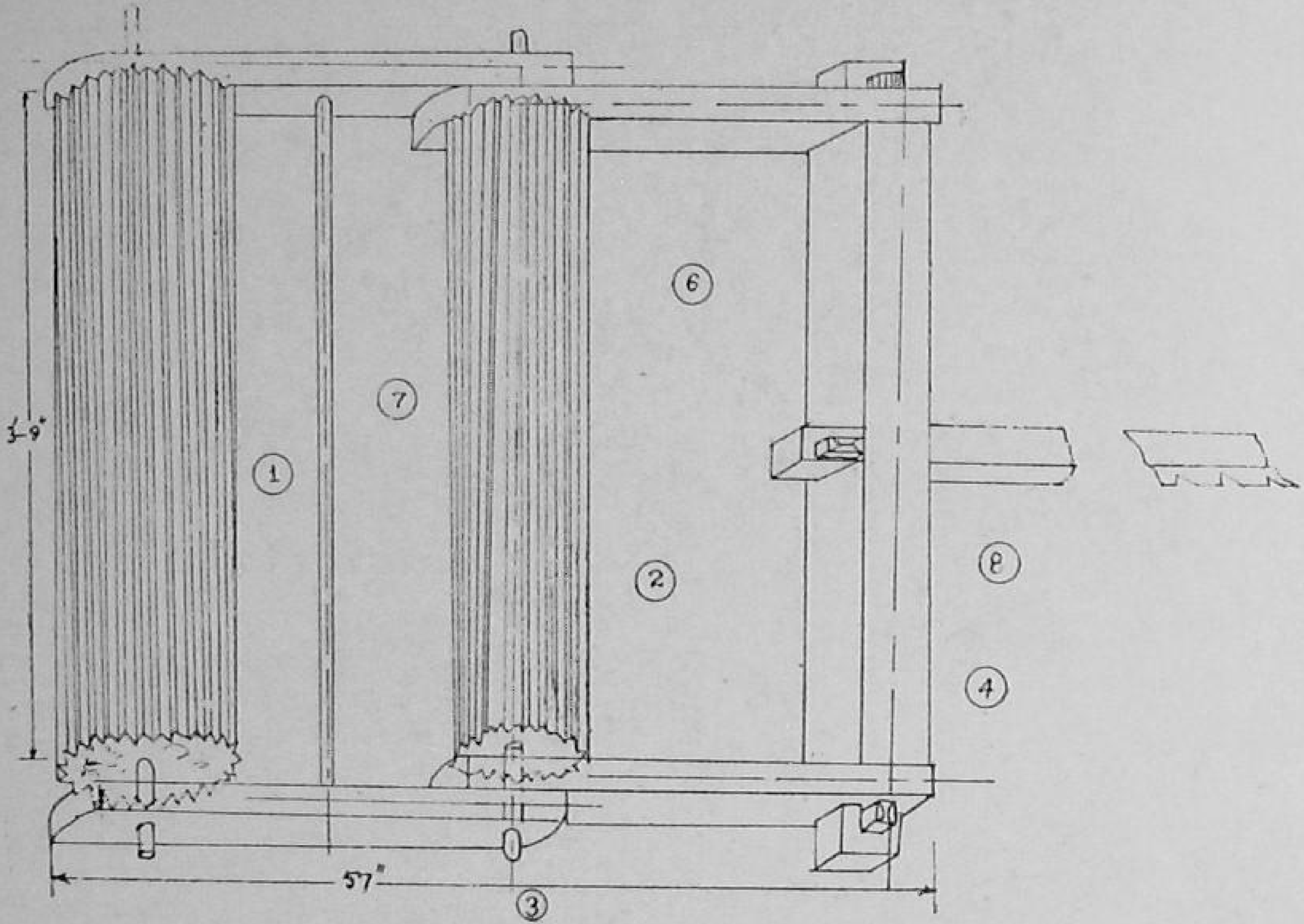
Threshing Roller—Coorg

ROLLERS

THRESHING ROLLER—PONUGALLU (COORG)

1.	Classification	Threshing implement
2.	Name (English and local)	Threshing roller—Ponugallu
3.	Name of the State and District	Coorg—Fraserpet in Coorg
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Hard stone for roller, wood for other parts and mild steel for axle
6.	Weight of the implement	800 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 35 to 38
9.	Service life	30 to 40 years
10.	Usage	It is used for threshing of crops
11.	Method of application	The implement is hitched to the yoke by the beam. The implement is driven round and round over the crops spread on the threshing floor
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 2.50
14.	Work rate	Aout 3600 lb. to 4,000 lb. of crop can be threshed in a day of 8 hrs. by one pair of bullocks
15.	Cost of operation per acre	Rs. 10 per acre including charges for 4 labourers
16.	Whether all purpose or used for specific purpose	Used for threshing of crops specifically
17.	Season of use	In the harvesting season of crops
18.	Total number of working days in a year	60 days
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	The implement is used for about two months in a year during the harvesting season.

PLATE 113

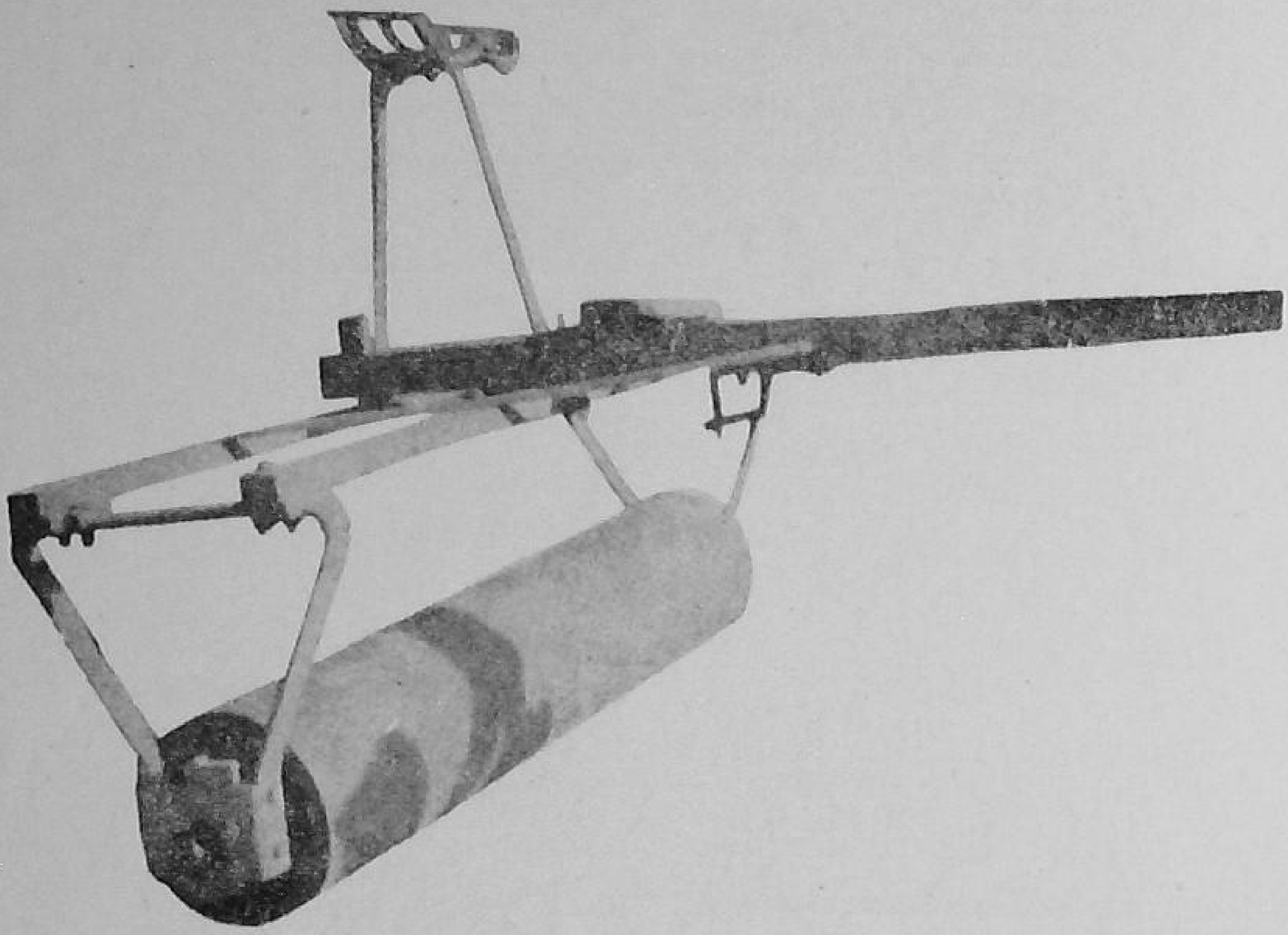


Roller (Mercara) Coorg

ROLLERS

Double Roller—Hante Machine (Coorg)

1.	Classification	Land preparation implement
2.	Name (English and local)	Double roller—Hante machine
3.	Name of the State and District	Coorg—Mercara
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Nandi, Mathi and Kooly wood
6.	Weight of the implement	232 lb.
	(i) Iron part	—
	(ii) Wooden part	232 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 15 to 20
9.	Service life	10 years
10.	Usage	It is used for clod crushing, pulverising and pressing the soil
11.	Method of application	The implement is hitched to the yoke by beam.
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 2
14.	Work rate	2 acres per day
15.	Cost of operation per acre	Rs. 3.25
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	The rollers are corrugated. Re-serration is necessary once in 4 years. This implement is not so effective in crushing the clods as a modern roller



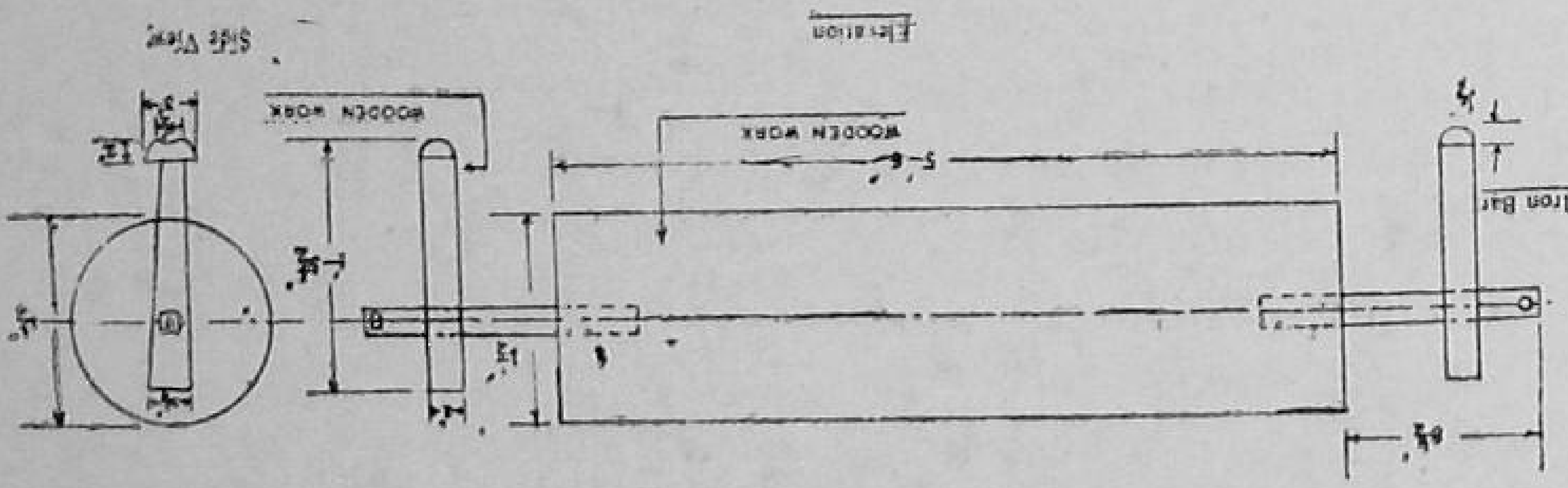
Roller (Jullundur) Punjab

ROLLERS

Roller—Girari (Punjab)

1.	Classification	Land preparation implement
2.	Name (English and local)	Roller—Girari
3.	Name of the State and District	Punjab—Jullundur
4.	Manufacturers and source of availability	M/s Engineering Works, Batala Distt. Gurdaspur
5.	Materials used	Iron and mild steel
6.	Weight of the implement	533 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One pair of bullocks and one man
8.	Cost	—
9.	Service life	20 to 25 years
10.	Usage	Used for breaking up clods in the field
11.	Method of application	The implement is hitched to the yoke with the beam
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	4 acres per day
15.	Cost of operation per acre	Rs. 2
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	All the year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	Used on Departmental Agricultural Farms only
20.	Origin	Foreign
21.	Remarks	—

PLATE 115

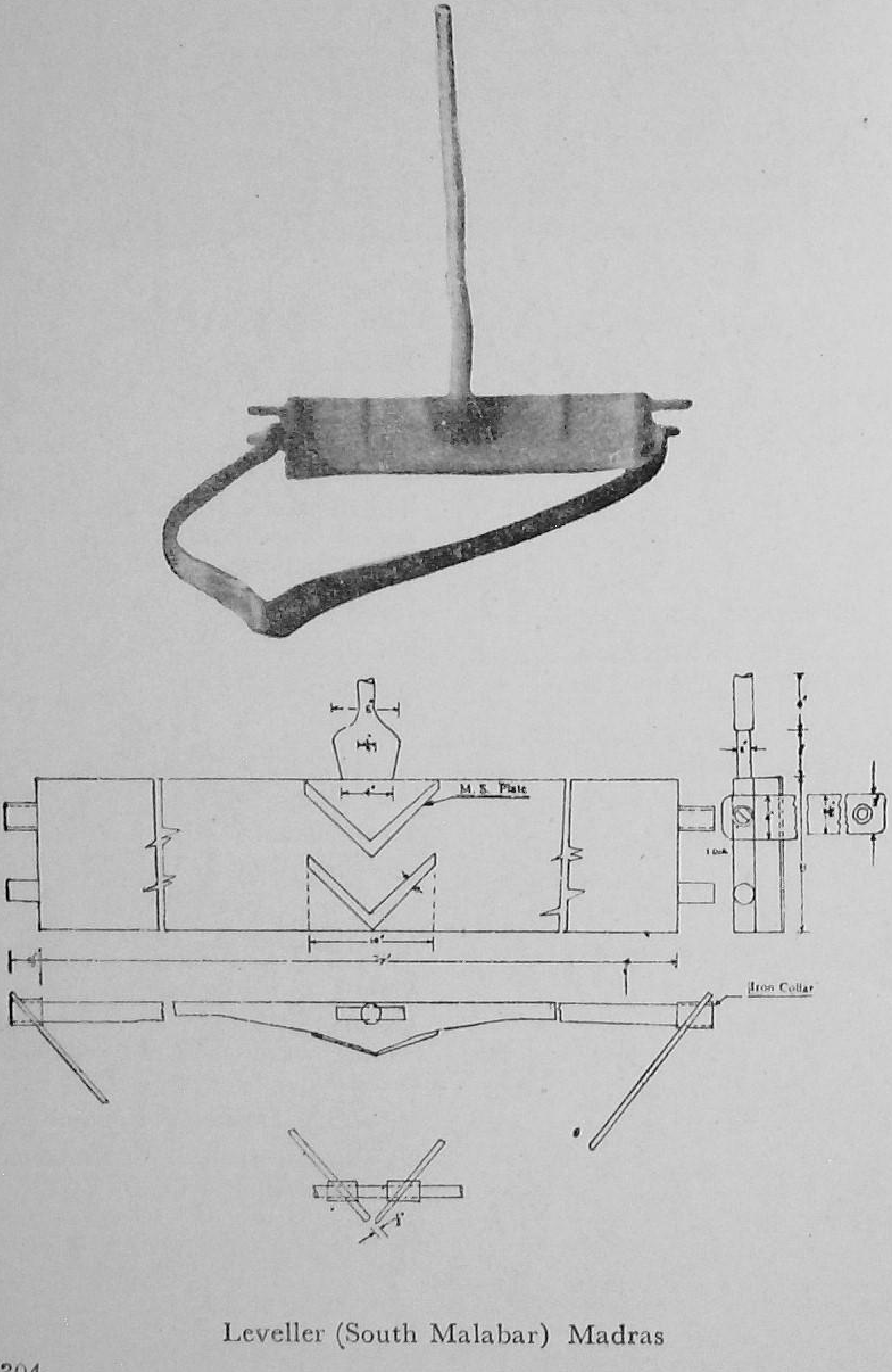


Roller (Bulandshahar) Uttar Pradesh

ROLLERS

Roller (Uttar Pradesh)

1.	Classification	Land preparation implement
2.	Name (English and local)	Roller
3.	Name of the State and District	U.P.—Bulandshahar
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Wood
6.	Weight of the implement	205 lb.
	(i) Iron part	—
	(ii) Wooden part	205 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 56
9.	Service life	6 years
10.	Usage	It is used for breaking clods and pressing the soil
11.	Method of application	The implement is hitched to the yoke by ropes and is driven by a pair of bullocks
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1.25
14.	Work rate	4 acres per day
15.	Cost of operation per acre	Rs. 1.75
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	All the year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 50 per cent
20.	Origin	Indian
21.	Remarks	An identical type of roller has been reported from the following localities (1) Karnal District of Punjab (2) Sirmur District of Himachal Pradesh.



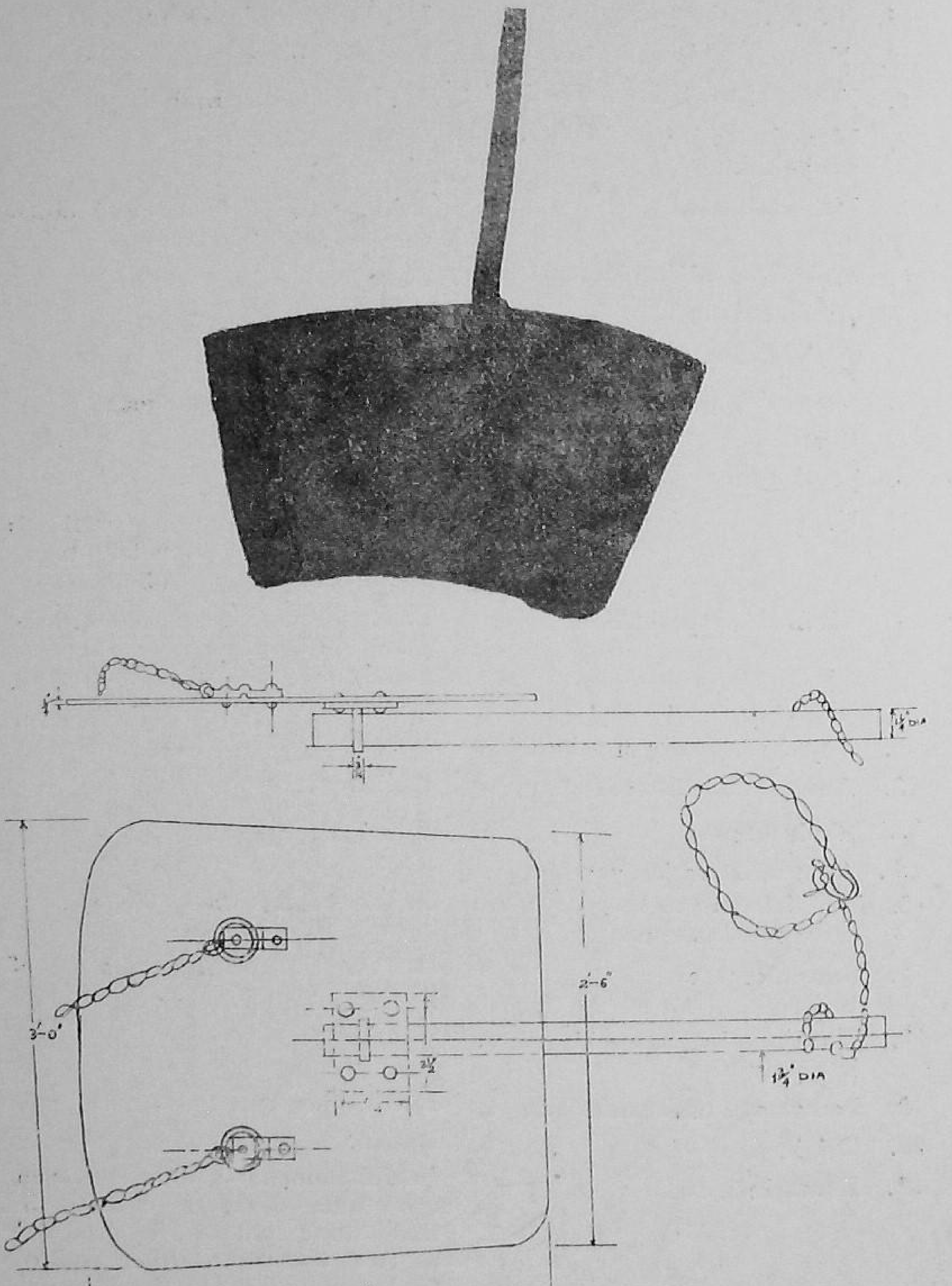
Leveller (South Malabar) Madras

LEVELLERS

Leveller—Urcha Palakai (Madras)

1.	Classification	Land preparation implement
2.	Name (English and local)	Leveller-Urcha Palakai
3.	Name of the State and District	Madras—South Malabar
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Teak wood for board and tamarind for shaft poles
6.	Weight of the implement	30-40 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 15
9.	Service life	5-6 years
10.	Usage	Used for levelling of wetlands after puddling and before transplanting of paddy seedlings.
11.	Method of application	The implement is connected to the yoke by a shaft pole and a handle is provided for effecting proper levelling
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1.50
14.	Work rate	1.5 acres per day.
15.	Cost of operation per acre	Rs. 3
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	In the transplanting season of paddy
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	15 to 20 per cent
20.	Origin	Indian
21.	Remarks	The implement is different from the other levelling boards, in that shaft poles are attached to two bosses at either end of the board and not to the face.

PLATE 117

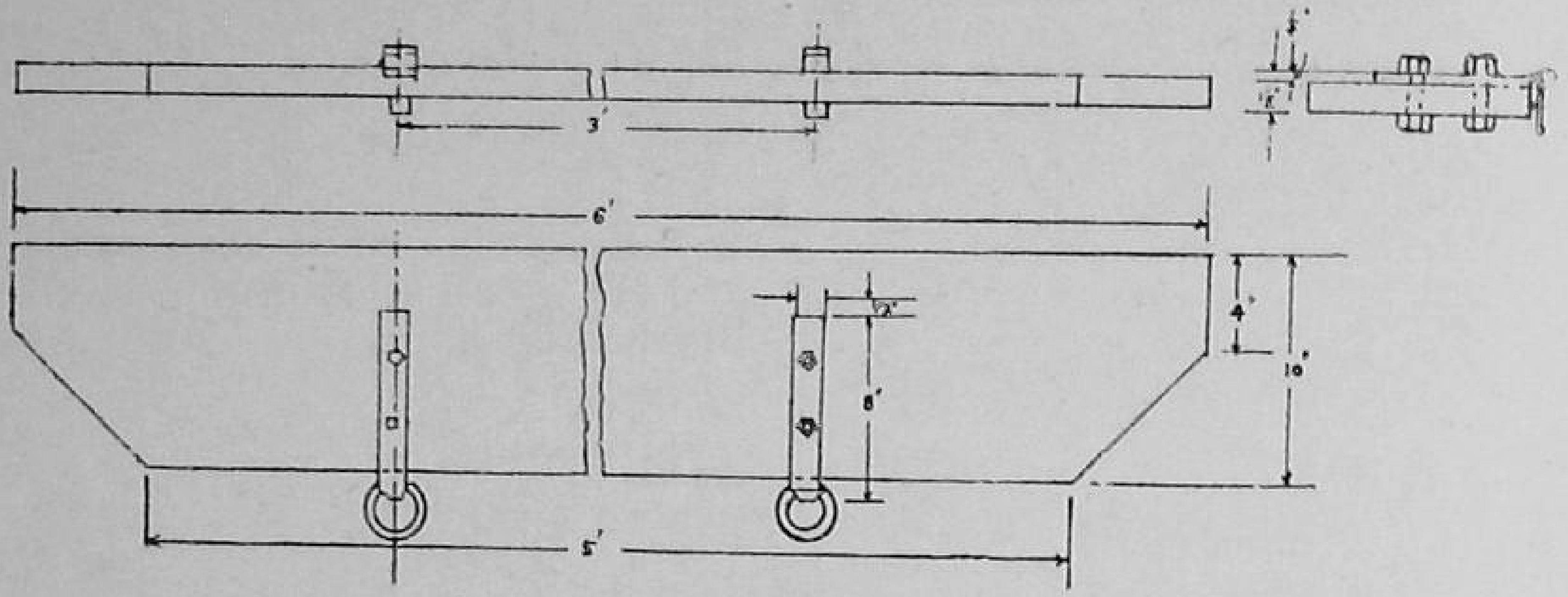


Leveller (Coimbatore) Madras

LEVELLERS

Leveller—Votti (Madras)

1.	Classification	Land preparation implement
2.	Name (English and local)	Leveller—Votti
3.	Name of the State and District	Madras—Coimbatore
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Babul, Vengai wood for handle and H.C. steel or M.S. for levelling board
6.	Weight of the implement	35 to 40 lb.
	(i) Iron part	30 lb.
	(ii) Wooden part	5 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 15
9.	Service life	8 to 10 years
10.	Usage	The implement is used after harrowing to level the field just before sowing. The implement scoops the earth at higher level and throws it at lower levels.
11.	Method of application	The implement is fastened to the yoke shaft either by ropes or chains and is provided with wooden handle for controlling the implement
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 1
14.	Work rate	1.5 acres per day
15.	Cost of operation per acre	Rs. 3 to 4
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	All the year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 40 per cent.
20.	Origin	—
21.	Remarks	The steel boards are generally made from the side plates of sugarcane pans. This is mainly used in dry soils.

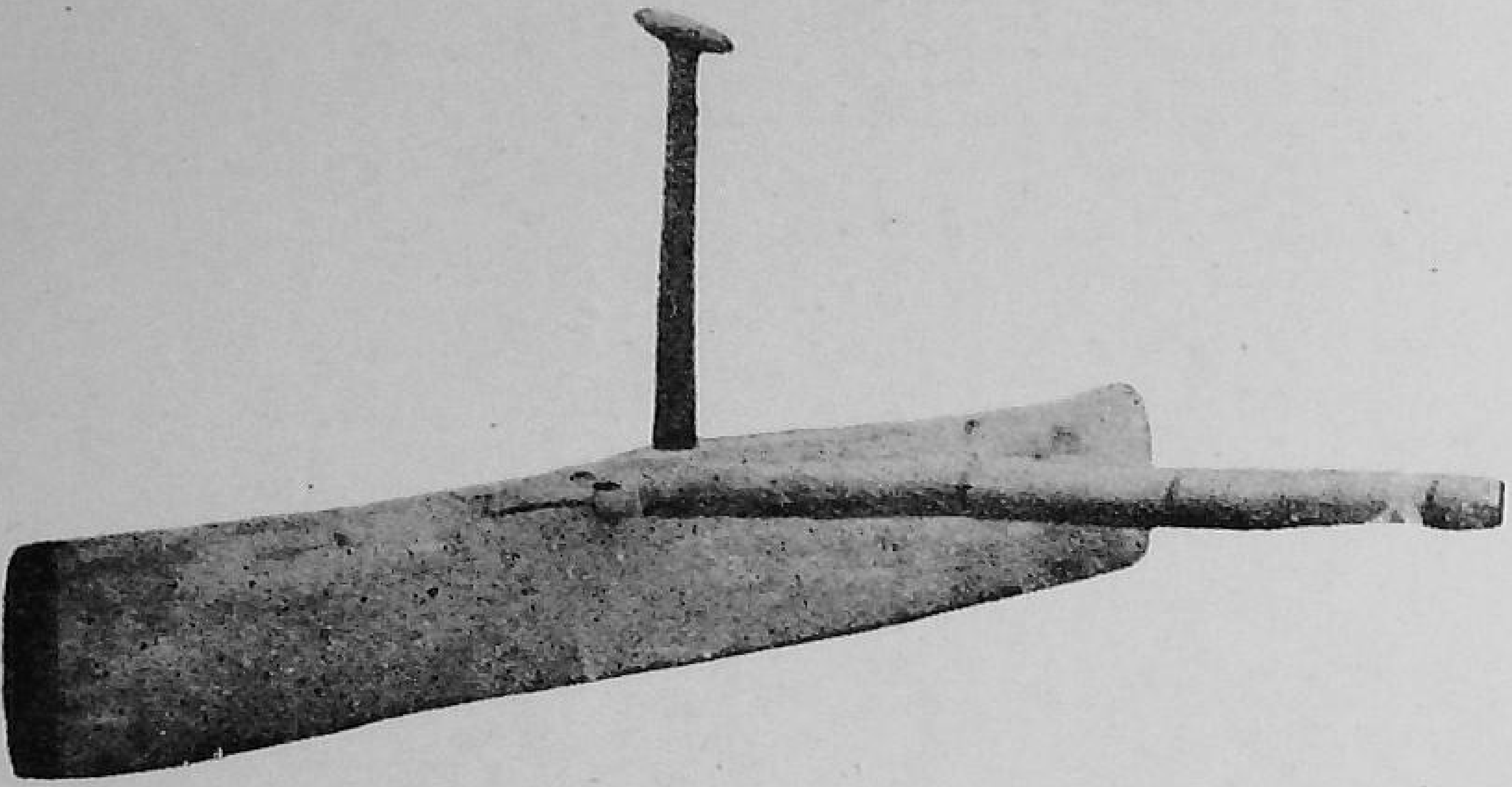


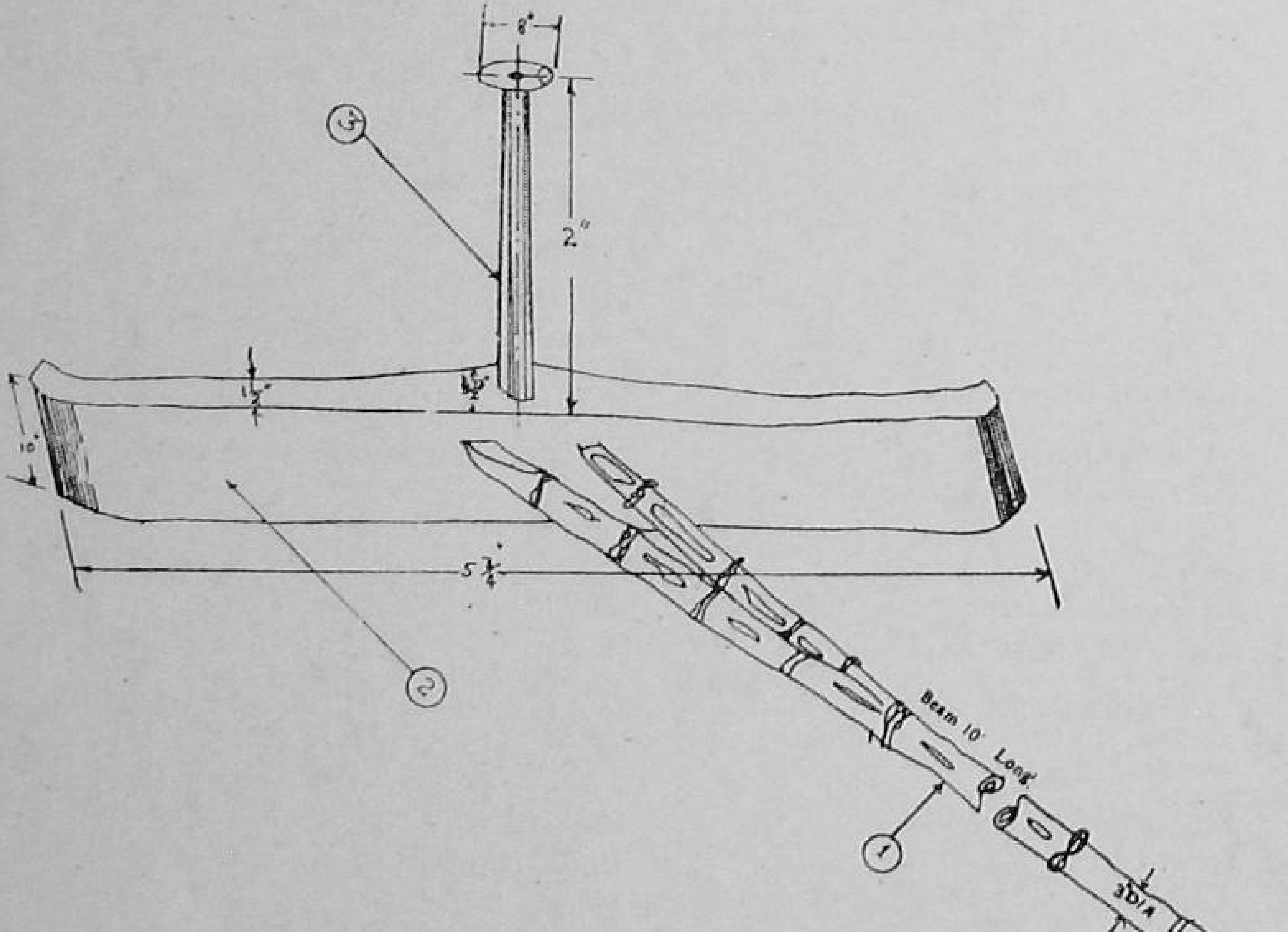
Leveller (Tanjore) Madras

LEVELLERS

Leveller or Plank—Palakai (Madras)

1.	Classification	Land preparation implement
2.	Name (English and local)	Leveller or plank - Palakai
3.	Name of the State and District	Madras—Tanjore, Trichy, Chingleput, Salem, Coimbatore and Arcot
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Babul and Venteak
6.	Weight of the implement	20 to 30 lb.
	(i) Iron part	—
	(ii) Wooden part	20 to 30 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 10 to 15
9.	Service life	6 years
10.	Usage	Used for levelling the puddled fields
11.	Method of application	The leveller is hitched to the yoke by a rope or by hooking a split bamboo shaft pole and is driven by a pair of bullocks
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 1
14.	Work rate	1.5 to 2 acres per day
15.	Cost of operation per acre	Rs. 3
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	—
18.	Total number of working days in a year.	—
19.	Percentage of farmers using it	About 60 to 70 per cent
20.	Origin	Indian
21.	Remarks	A similar type of leveller has been reported from the following areas (1) Karnal District of the Punjab (2) Cuttack District of Orissa State.





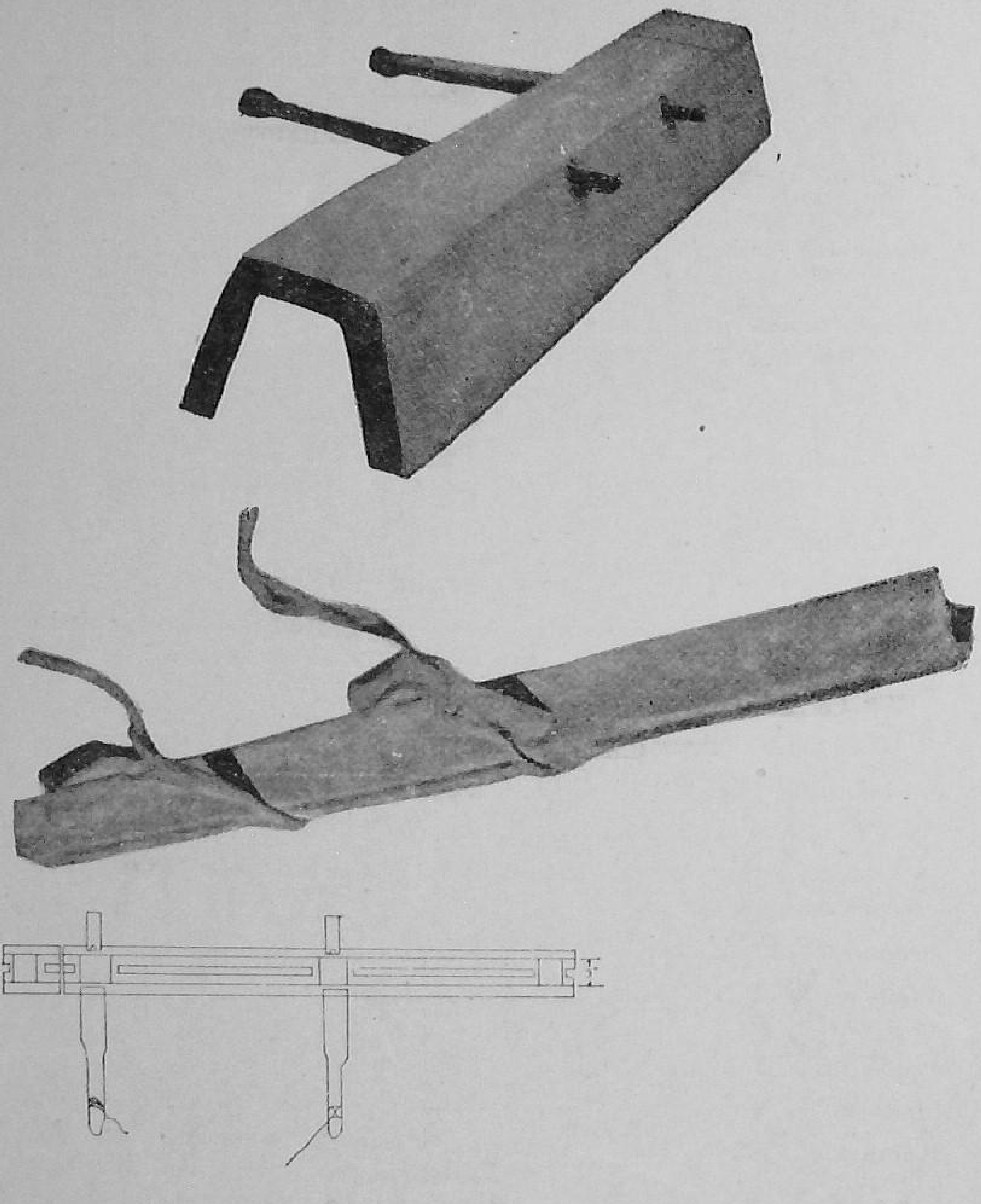
Leveller (Hassan) Mysore

LEVELLERS

Leveller—Mattada Halage (Mysore)

1.	Classification	Land preparation implement
2.	Name (English and local)	Leveller—Mattada Halage
3.	Name of the State and District	Mysore—Hassan, Mysore, Kolar, Mandya, Chikmagalur and Shimoga
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Mango, jack, Babul wood and bamboo
6.	Weight of the implement	35 lb.
	(i) Iron part	—
	(ii) Wooden part	35 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 6
9.	Service life	—
10.	Usage	For levelling
11.	Method of application	The free end of the beam is tied to the centre of the yoke
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	3 acres per day
15.	Cost of operation per acre	Rs. 1.50
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 90 per cent
20.	Origin	Indian
21.	Remarks	The average pull is 140 lb. An identical type of leveller has been reported from the following localities : (1) Coorg State (2) Gurdaspur District of Punjab (3) Shahdol District of Vindhya Pradesh (4) North and South Malabar.

PLATE 120

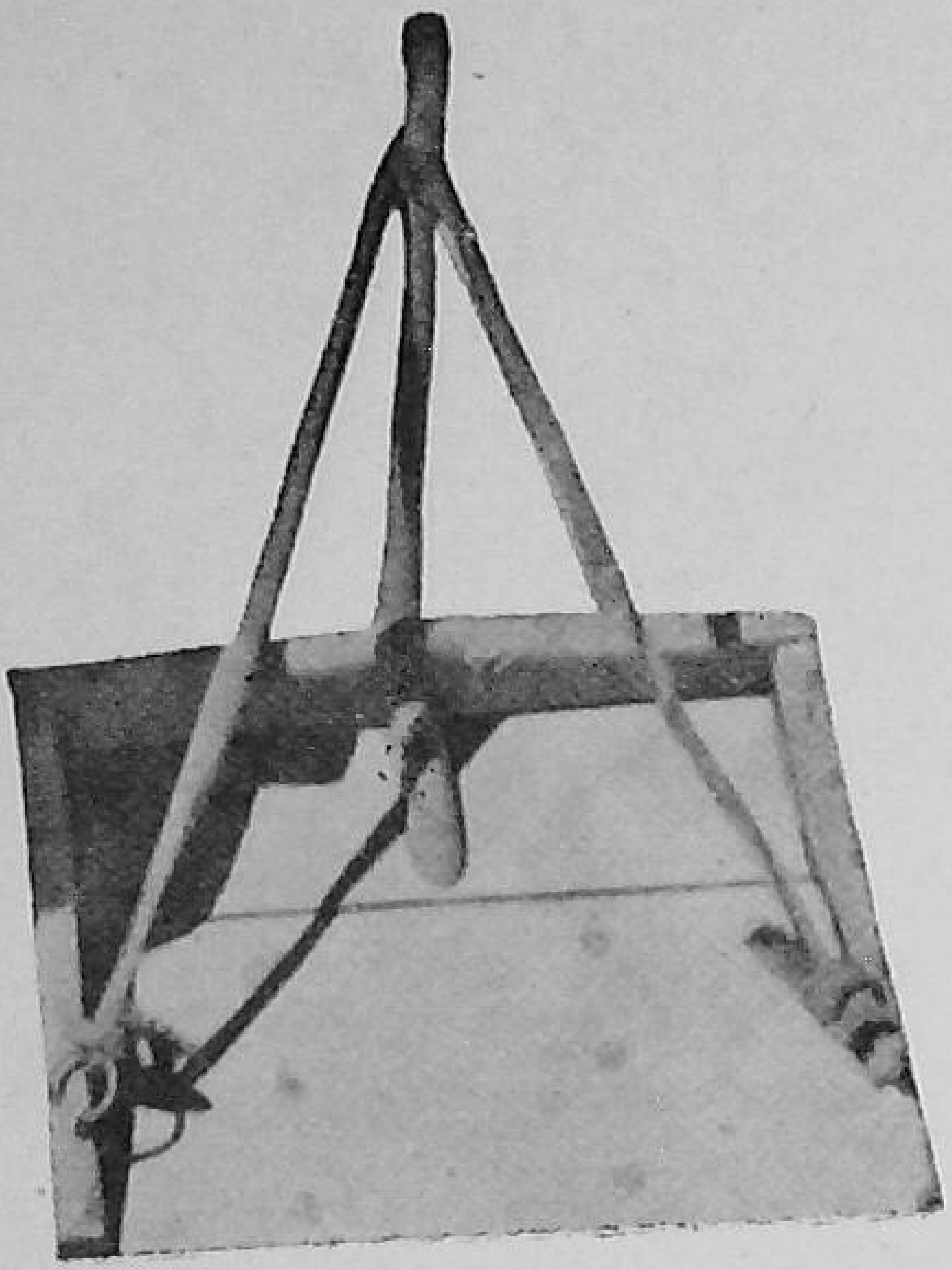


Leveller (Keonjhar) Orissa

LEVELLERS

Leveller or Clod Crusher—Mai (Orissa)

1.	Classification	Land preparation implement
2.	Name (English and local)	Leveller or clod crusher—Mai
3.	Name of the State and District	Orissa – Keonjhar
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Sal wood
6.	Weight of the implement	21.5 lb.
	(i) Iron part	—
	(ii) Wooden part	21.5 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 3
9.	Service life	2 to 3 years
10.	Usage	It is used for clod crushing and thereby pulverizing the soil
11.	Method of application	The implement is hitched to the yoke by means of ropes.
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	2.5 acres per day
15.	Cost of operation per acre	Re. 1
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	All the year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	It is similar to the leveller used in Shimoga district of Mysore State except that there are elongated rectangular holes in the upper surface,

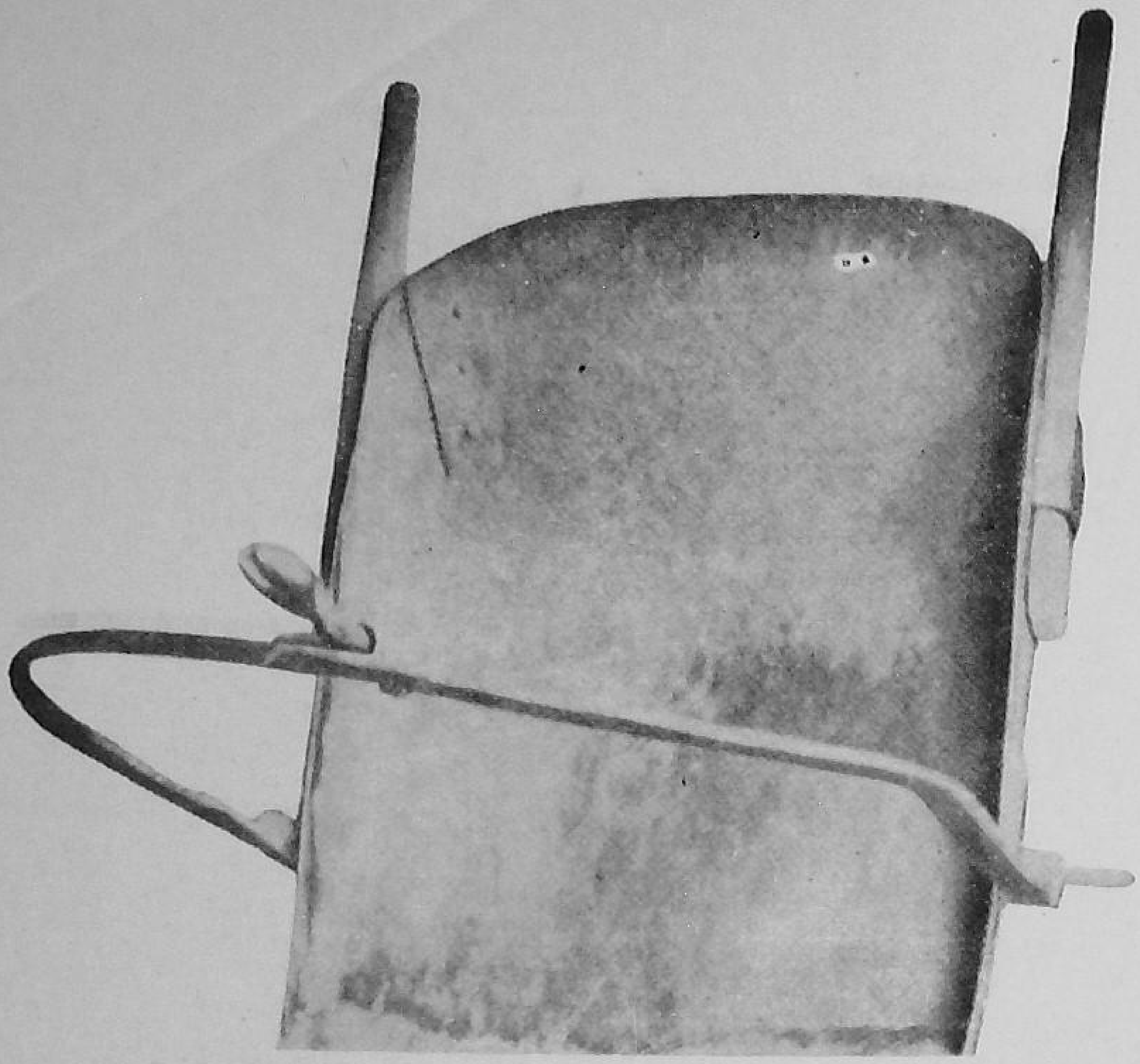


Leveller (Rohtak) Punjab

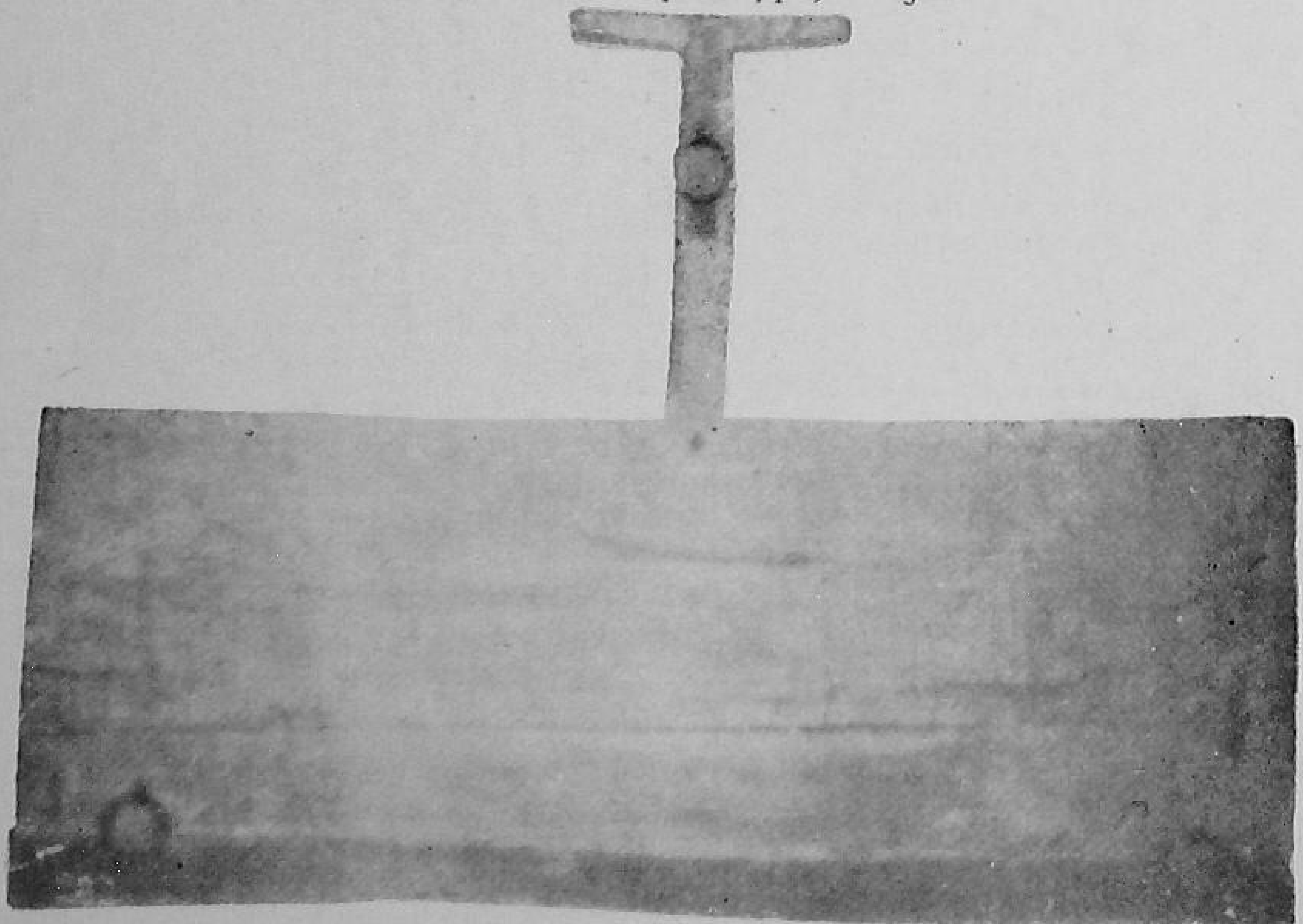
LEVELLERS

Leveller—Karah (Punjab)

1.	Classification	Land preparation implement
2.	Name (English and local)	Leveller—Karah
3.	Name of the State and District	Punjab—Rohtak
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Iron, Shisham aud Babul wood
6.	Weight of the implement	40 to 80 lb.
	(i) Iron part	80 lbs. (All steel leveller)
	(ii) Wooden part	40 lb. (wooden leveller)
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 18 for wooden one Rs. 24 for all steel one
9.	Service life	3 years
10.	Usage	For levelling the fields by pushing the earth from higher levels to lower levels
11.	Method of application	The implement is hitched to the yoke with two ropes tied to hooks on the implement and drawn by a pair of bullocks
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 1
14.	Work rate	One acre per day
15.	Cost of operation per acre	Rs. 6
16.	Whether all purpose or used for specific purpose	Used only for levelling purposes or carrying soil from one place to another
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	This leveller has wooden walls 6 inches deep which check the fall of the earth on the sides.



Leveller (Buck Scraper Type) Punjab

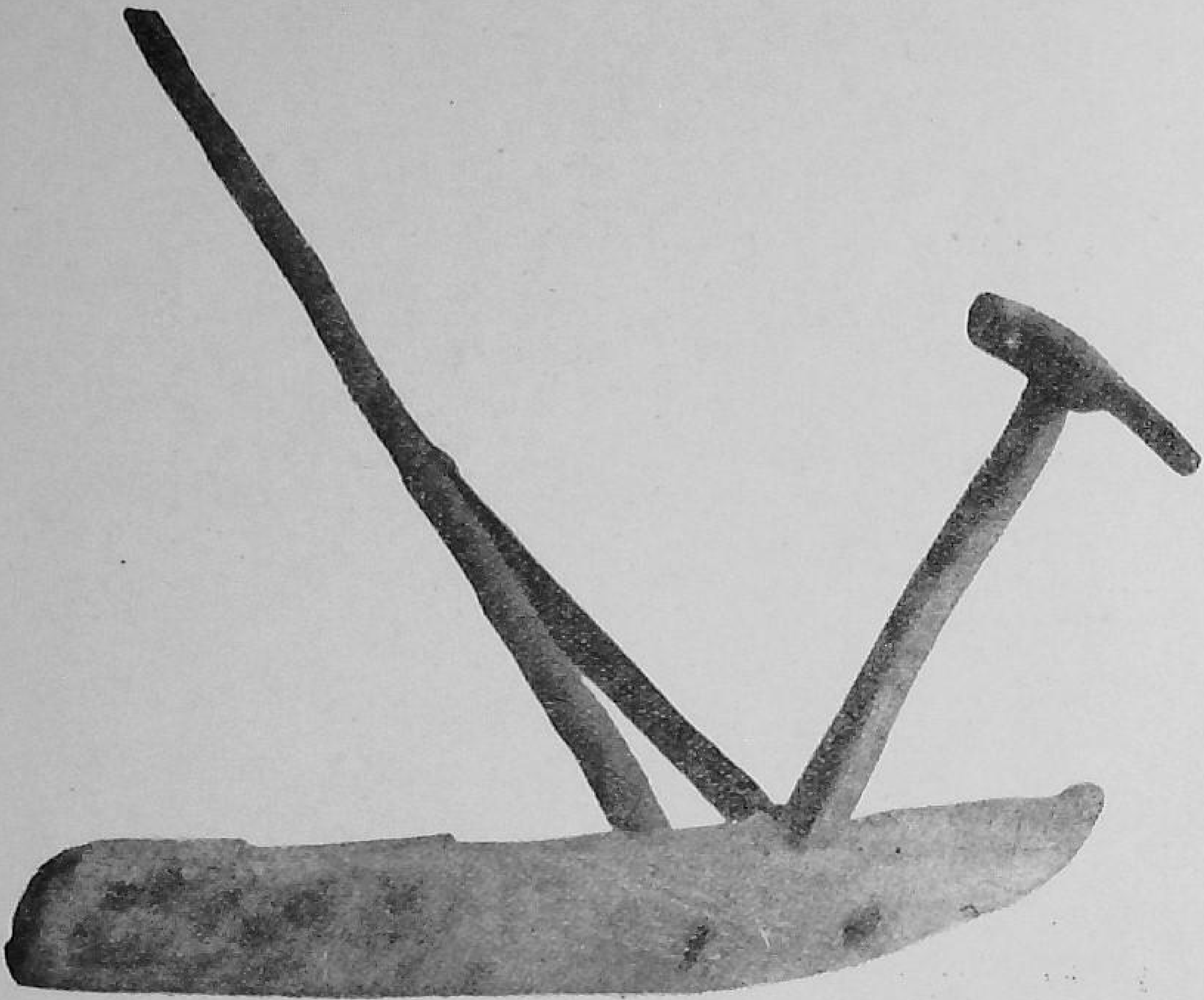


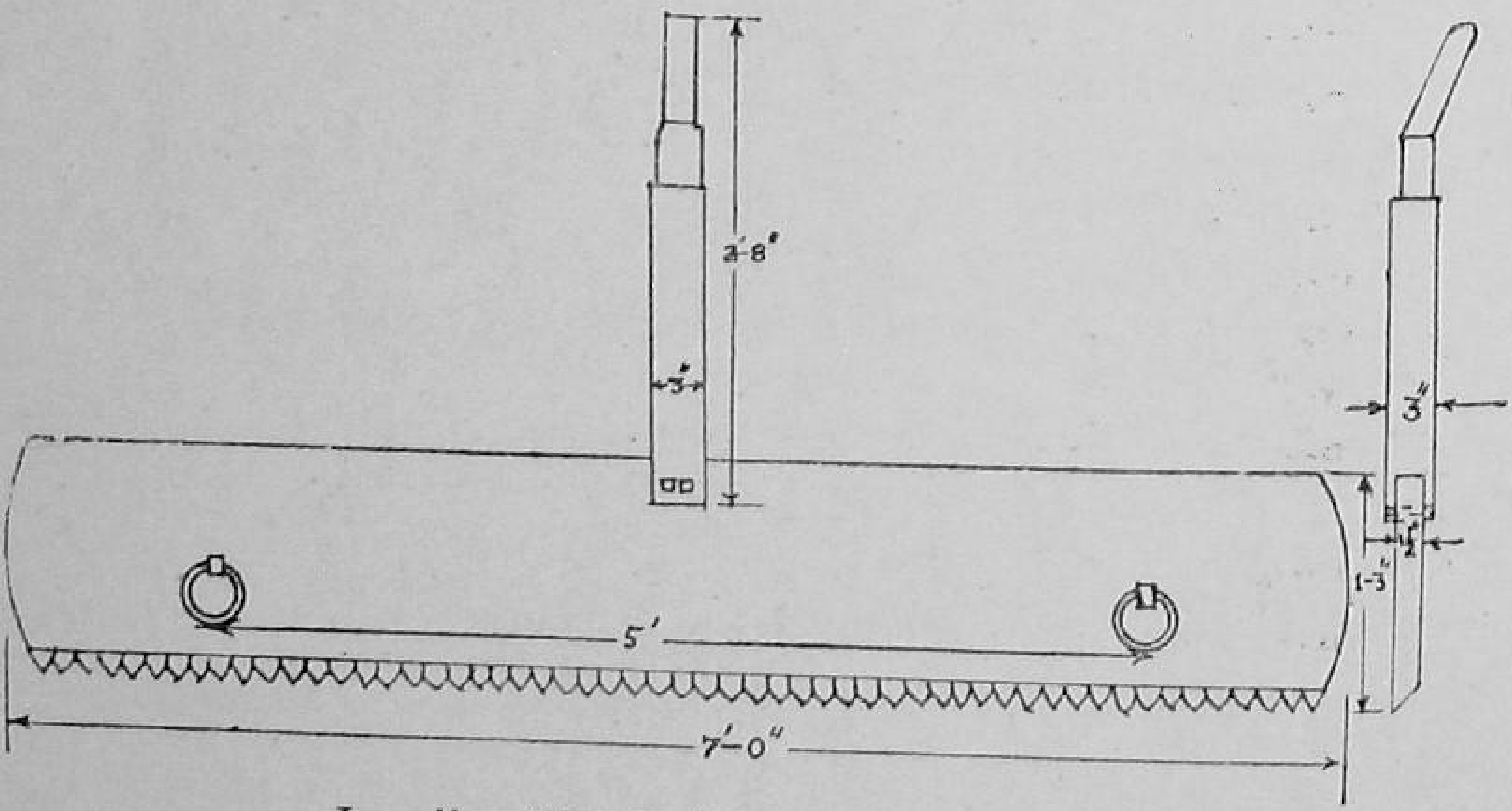
Leveller (Karnal) Punjab

LEVELLERS

LEVELLER—KARAH OR GORI (PUNJAB)

1.	Classification	Land preparation implement
2.	Name (English and local)	Leveller, earth scoop—Karah or Gori
3.	Name of the State and District	Punjab—Karnal
4.	Manufacturers and source of availability	1. M/s. Mukand Lal, Subzi Mandi, Karnal 2. M/s. Parkash Engineering Works Batala, District Gurdaspur
5.	Materials used	Shisham or Sal and mild steel
6.	Weight of the implement	88 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One pair of bullocks and one man
8.	Cost	Rs. 35
9.	Service life	25 years
10.	Usage	Used for levelling uneven fields
11.	Method of application	The implement is hitched to the yoke with the iron hooks by chains.
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.50
14.	Work rate	Depends upon the field conditions
15.	Cost of operation per acre	Rs. 4
16.	Whether all purpose or used for specific purpose	Used for levelling purposes only
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	Used by departmental Agriculture Farms and some big landholders
20.	Origin	Foreign
21.	Remarks	Other implements used for similar purpose by farmers are wooden karahas or karahi, wooden suhaga. An identical type has also been reported from Madras and Vindhya Pradesh.



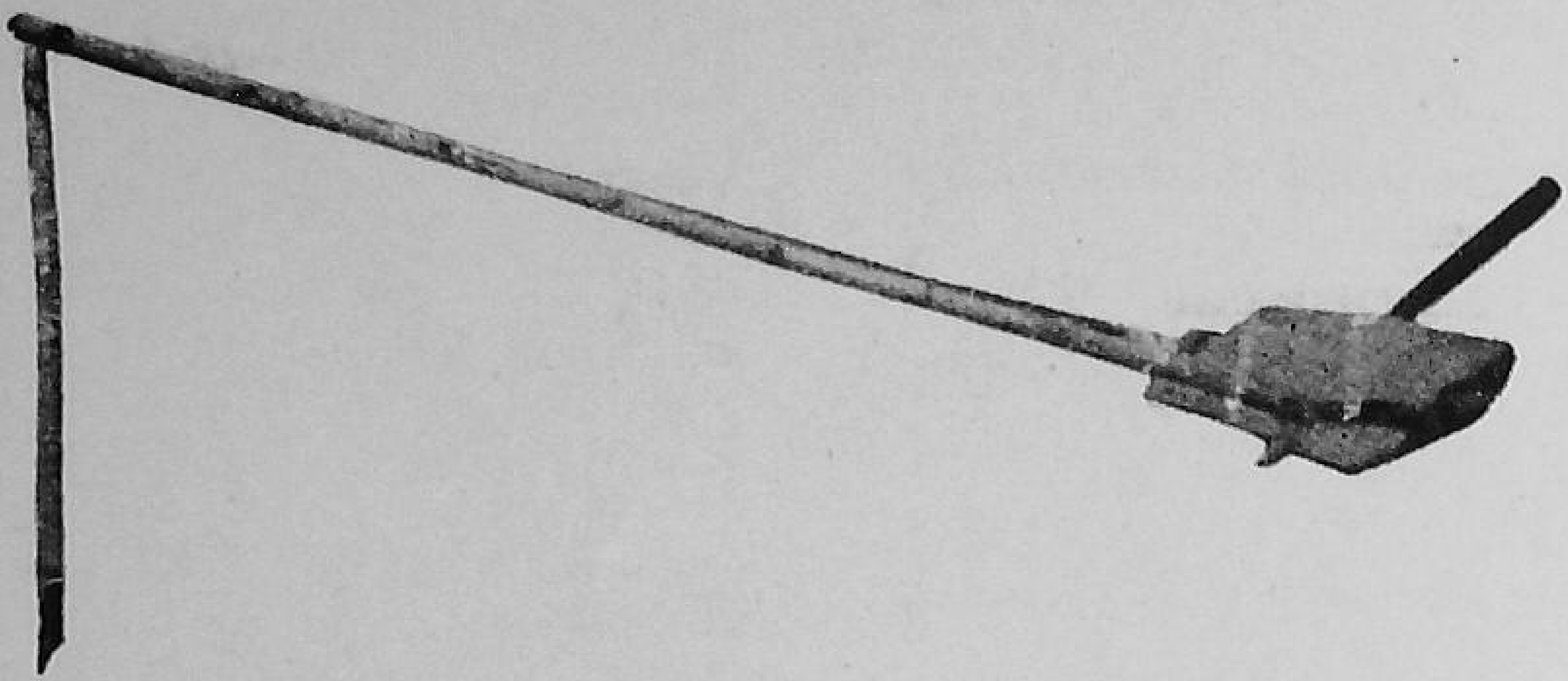


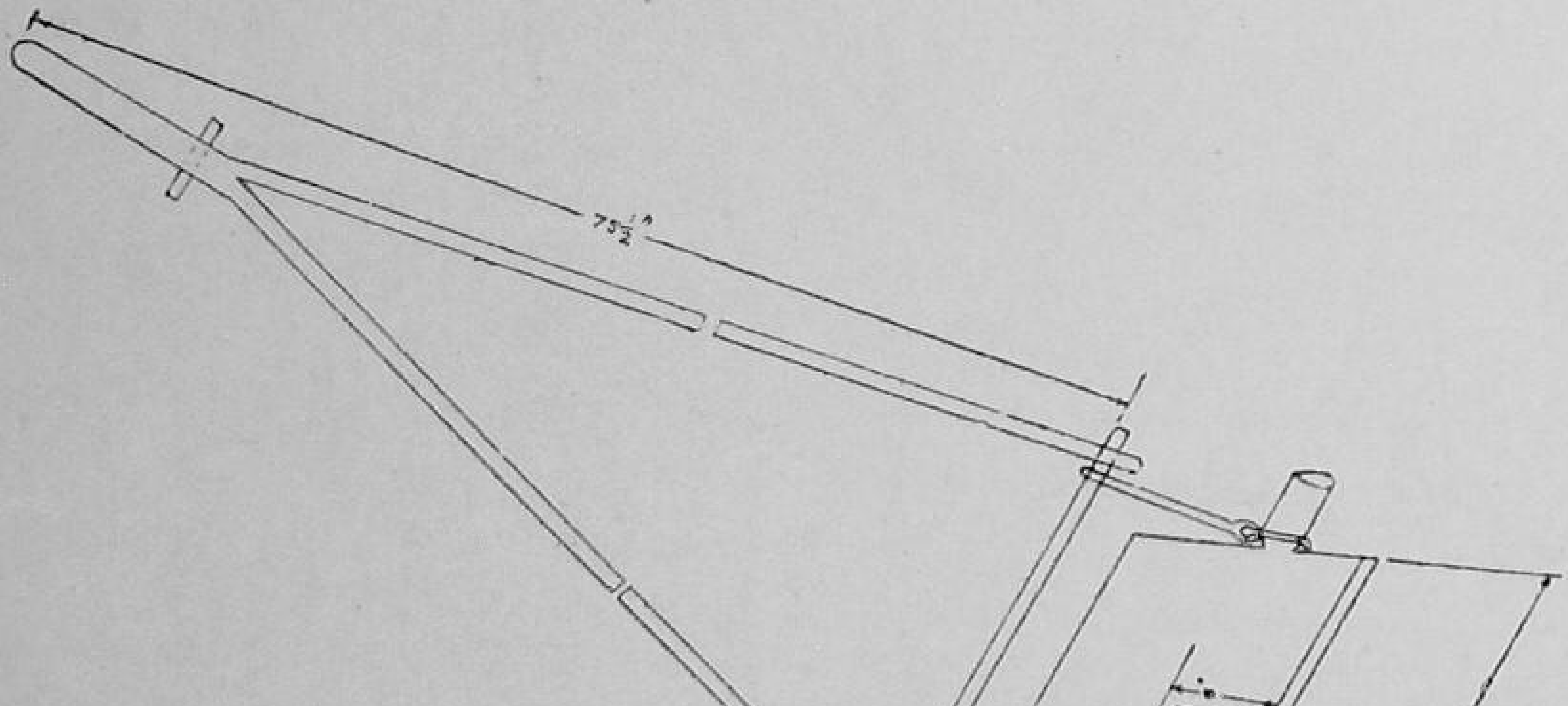
Leveller (Trichur) Travancore-Cochin

LEVELLERS

Leveller—Gnavari or Maram (Travancore - Cochin)

1.	Classification	Land preparation implement
2.	Name (English and local)	Leveller - Gnavari or Maram
3.	Name of the State and District	Travancore - Cochin—Trichur and Trivandrum.
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Teak
6.	Weight of the implement	40 to 50 lb.
	(i) Iron part	—
	(ii) Wooden part	40 to 50 lb.
7.	Operating power	One pair of bullocks or buffaloes and one man
8.	Cost	Rs. 25 to 30
9.	Service life	5 to 6 years
10.	Usage	Used for levelling the fields after ploughing
11.	Method of application	The implement is connected to the yoke with the help of 2 iron rings and fastening ropes and operated by a person who keeps standing on the flat surface of the leveller
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 2 to 3
14.	Work rate	0.5 acre per day
15.	Cost of operation per acre	Rs. 15 for levelling of dry lands Rs. 18 for levelling of wetlands
16.	Whether all purpose or used for specific purpose	Used specifically for levelling
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	The leveller is also sometimes used as a plank.





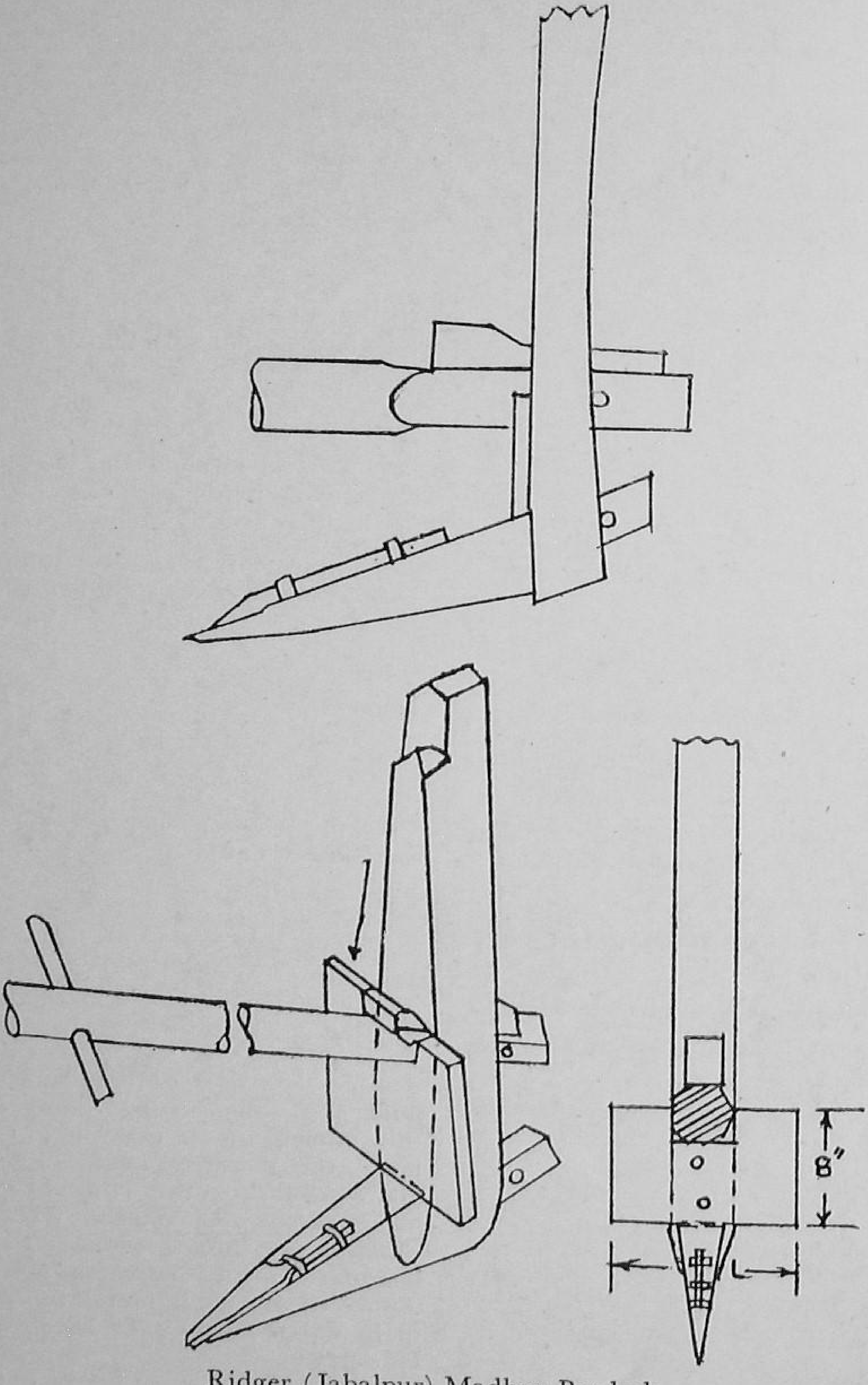
Leveller (Shahadol) Vindhya Pradesh

LEVELLERS

Leveller—Kurree (Vindhya Pradesh)

1.	Classification	Land preparation implement
2.	Name (English and local)	Leveller—Kurree
3.	Name of the State and District	Vindhya Pradesh—Shahadol, Datia, Tikamgarh
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Dhava, Seja, and mango wood
6.	Weight of the implement	35 lb.
	(i) Iron part	10 lb.
	(ii) Wooden part	25 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 4 to 8
9.	Service life	4 years
10.	Usage	It is used for levelling of uneven and sloping fields and constructing bandies around the field
11.	Method of application	The implement is hitched to the yoke by means of a split bamboo beam
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	—
15.	Cost of operation per acre	Rs. 3
16.	Whether all purpose or used for specific purpose	Used for levelling and constructing bandies only
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	Besides levelling the ploughed land and constructing bandies, this implement is also used to level the puddled fields. *Kean* and *Rahsee* are other two implements used for similar work. Bandies are bunds aronud the boundaries of the individual fields. An identical type is found in use in Balaghat District of Madhya Pradesh.

PLATE 125

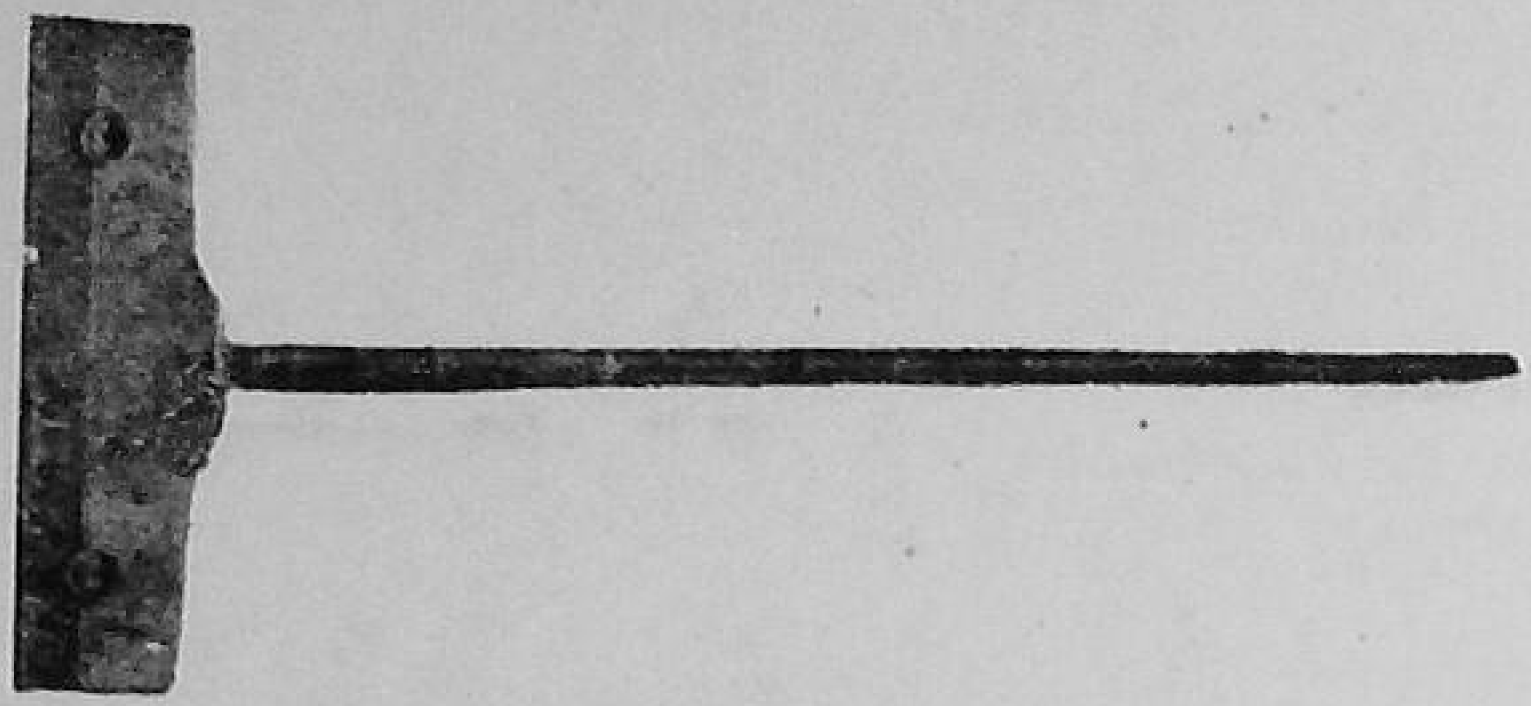


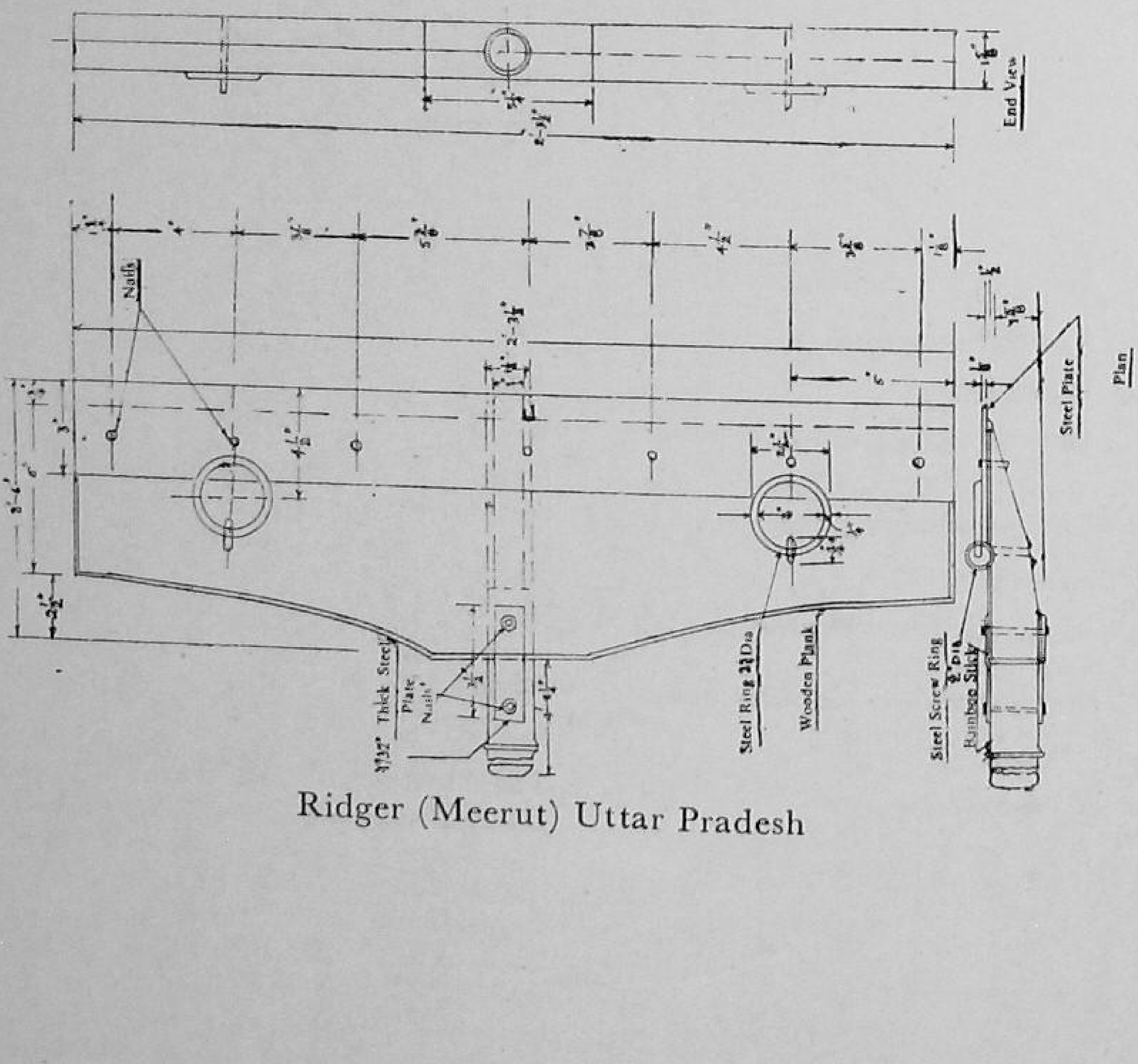
Ridger (Jabalpur) Madhya Pradesh

RIDGERS

Ridger (Madhya Pradesh)

1.	Classification	Land preparation implement
2.	Name (English and local)	Ridger
3.	Name of the State and District	Madhya Pradesh—Jabalpur
4	Manufacturers and source of availability	Village artisans
5.	Materials used	Wood
6.	Weight of the implement	40 lb. with a attachment
	(i) Iron part	—
	(ii) Wooden part	40 lb.
7.	Operating power	Two bullocks and one man
8.	Cost	Rs. 11 to 16
9.	Service life	1 to 3 years
10.	Usage	Used for making ridges for sugar-cane and vegetables in the season
11.	Method of application	Hitching arrangement is similar to that of a plough, The implement is attached to the yoke by means of a beam and ropes
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 2 to 2.50
14.	Work rate	2 acres per day
15.	Cost of operation per acre	Rs. 2
16.	Whether all purpose or used for specific purpose	Used for making ridges for sugar-cane and vegetables
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	This ridger is an ordinary *desi* plough with a ridging attachment fixed at the junction of shoe and body below the beam. The implement is a crude one and makes only small ridges. The work done by the implement is of poor quality and the ridges made by it have to be mended manually. It is also used in Uttar Pradesh, Bihar, Orissa, and Madras.



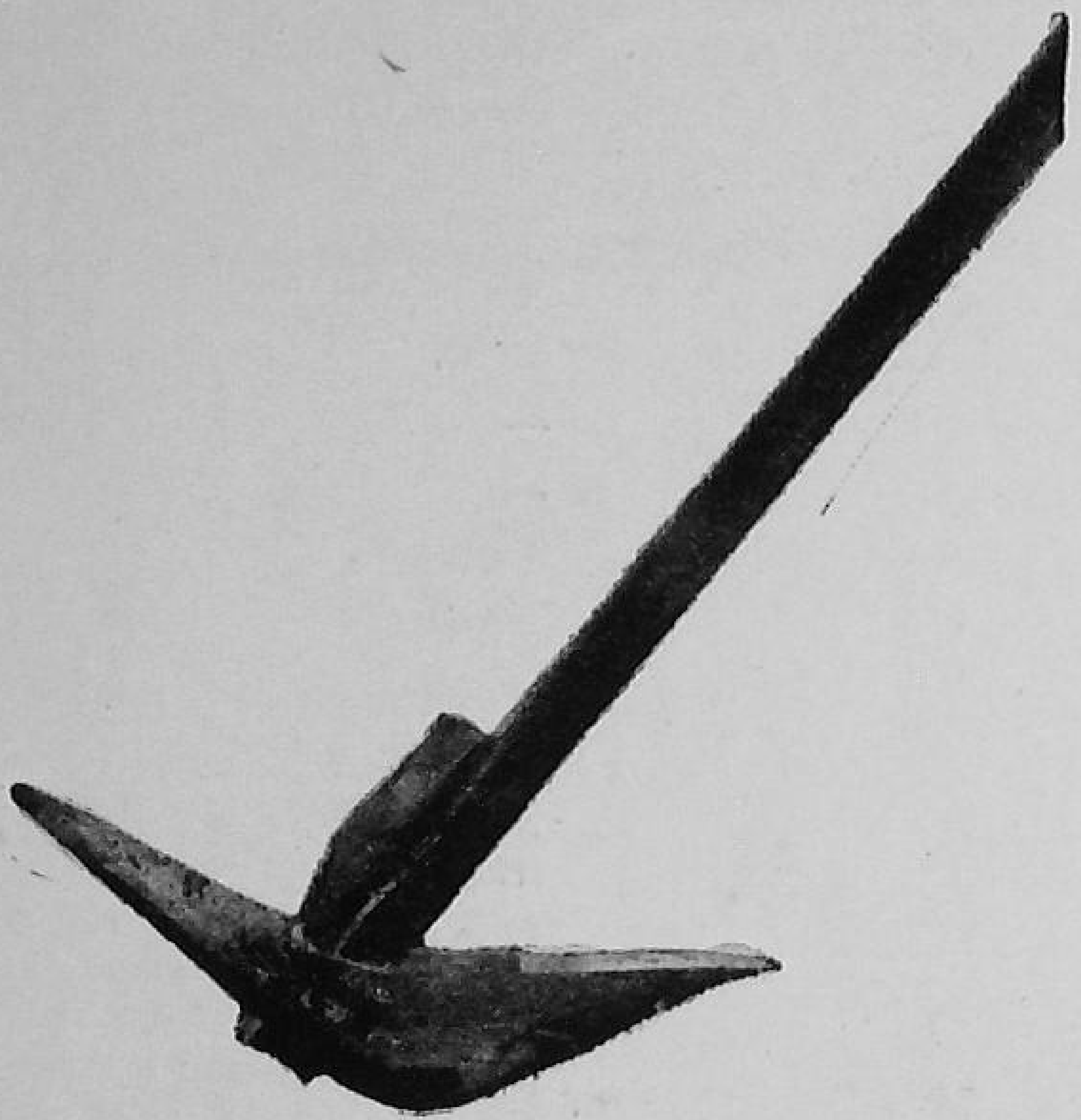


Ridger (Meerut) Uttar Pradesh

RIDGERS

Ridger—Karha—(Uttar Pradesh)

1.	Classification	Land preparation implement
2.	Name (English and local)	Ridger—Karha
3.	Name of the State and District	Uttar Pradesh—Meerut, Saharanpur, Bulandshahar
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Wood and mild steel
6.	Weight of the implement	10 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Two men
8.	Cost	Rs. 4
9.	Service life	3 years
10.	Usage	Used for making ridges for potato and groundnut etc., for irrigation purposes
11.	Method of application	One man holds the ridger straight and the other man pulls it towards him. Thus they collect the earth to form the ridges
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1.50
14.	Work rate	—
15.	Cost of operation per acre	Rs. 6
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season for use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	—

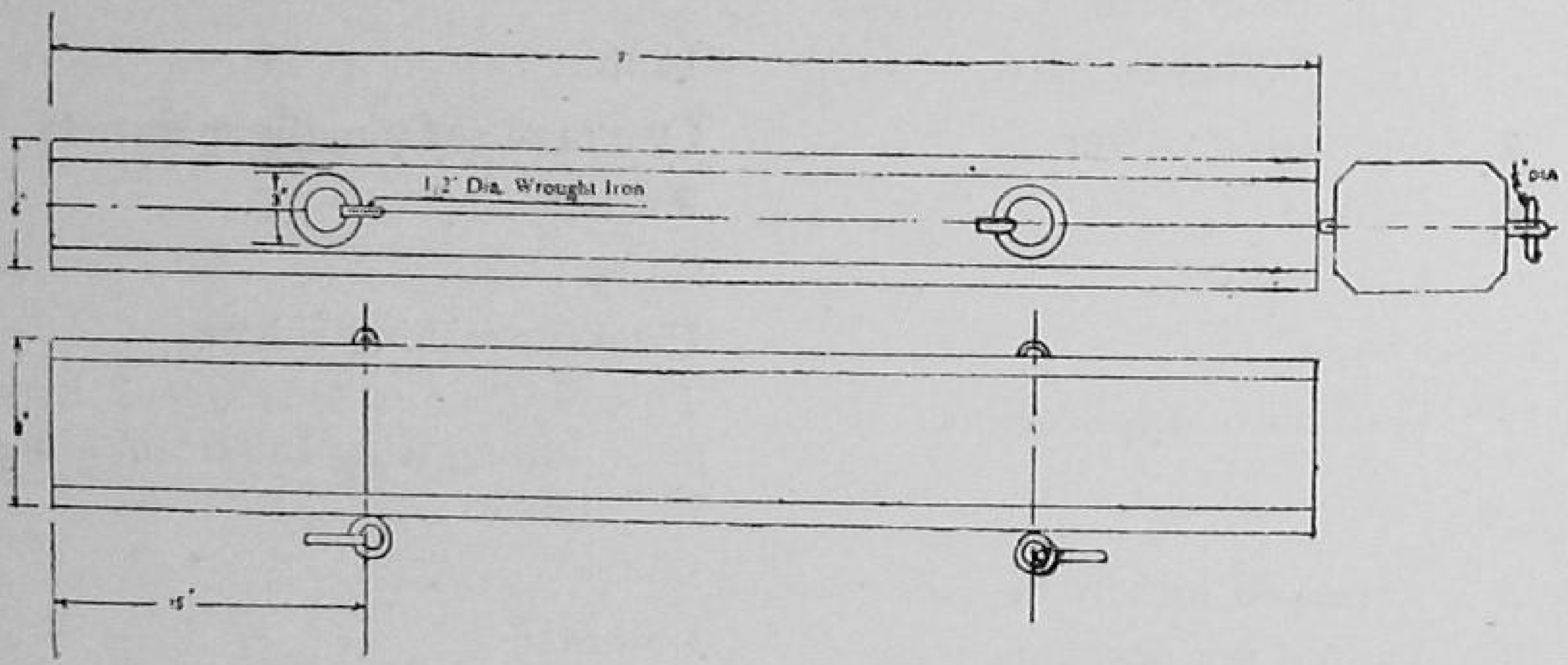


Ridger—West Bengal

RIDGERS

Ridger—Hath Langal, Hath Hal (West Bengal)

1.	Classification	Land preparation implement
2.	Name (English and local)	Ridger—Hath Langal (Bengali) Hath—Hal .
3.	Name of the State and District	West Bengal—Throughout the State leaving hilly regions
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Babul or Sal
6.	Weight of the implement	15 lb.
	(i) Iron part	—
	(ii) Wooden part	15 lb.
7.	Operating power	One man (Manually operated)
8.	Cost	Rs. 5
9.	Service life	2 years
10.	Usage	Used for making ridges
11.	Method of application	The implement is dragged by a man pulling it by the beam along the furrow
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance	Nominal
14.	Work rate	0.5 acre per day
15.	Cost of operation per acre	Rs. 3
16.	Whether all purpose or used for specific purpose	Used specifically for making ridges
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	100 per cent
20.	Origin	Indian
21.	Remarks	The implement is a depreciated form of plough. When a plough becomes unsuitable it is used as a ridger after removing the worn-out share.

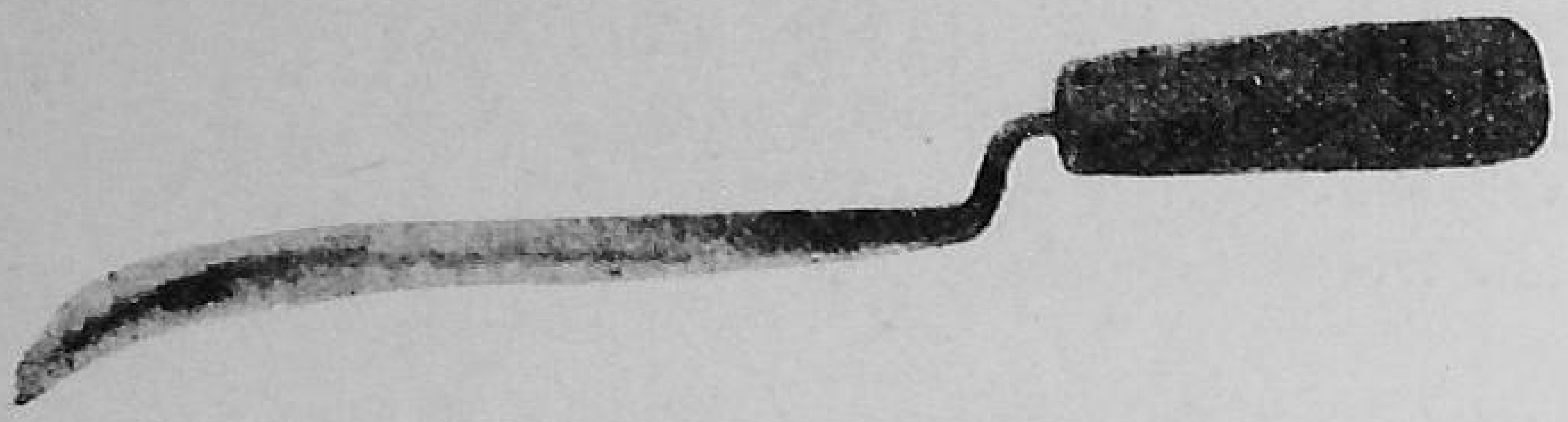


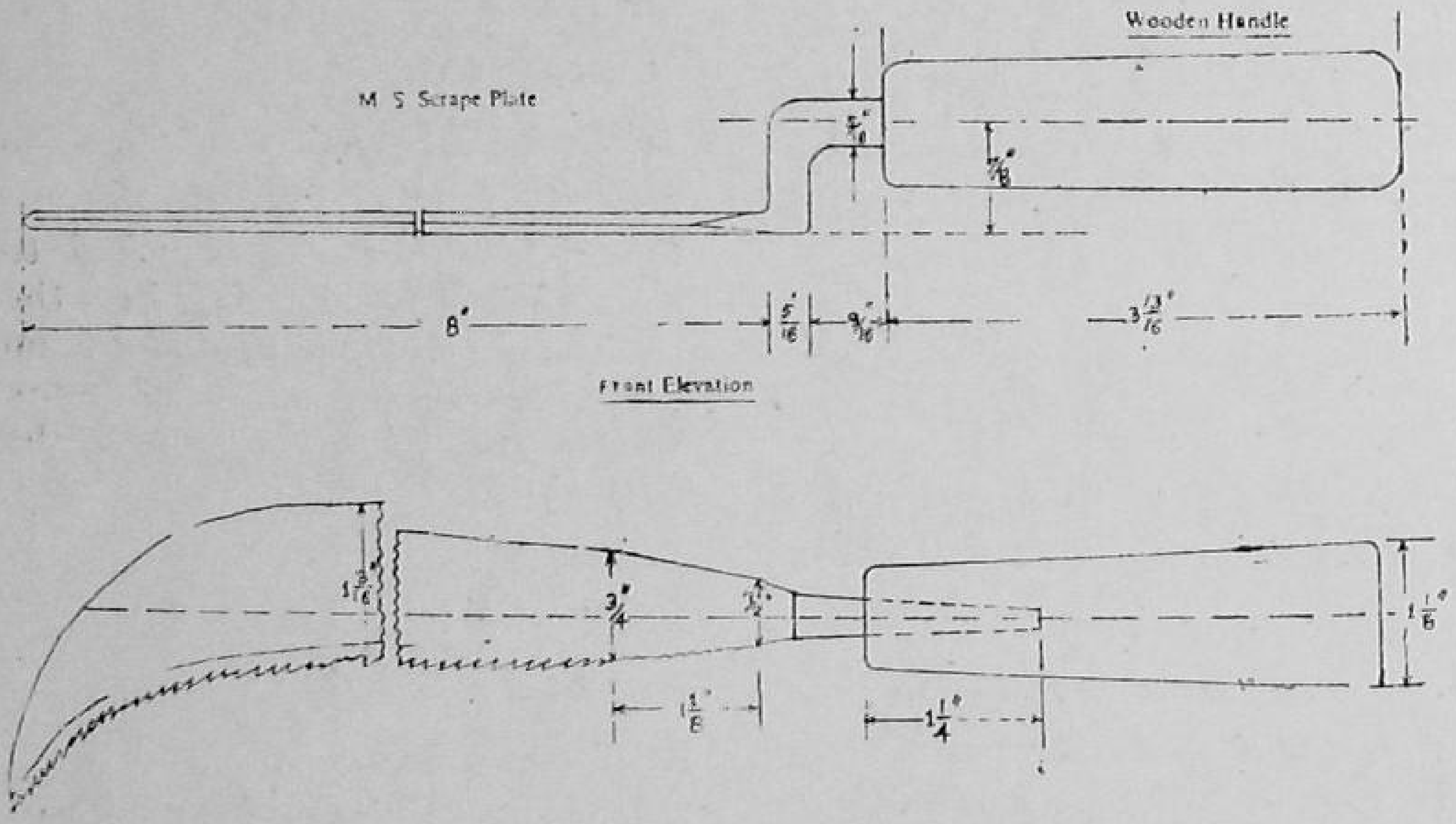
Clod Crusher (Nagpur) Madhya Pradesh

CLOD CRUSHERS

Clod Crusher—Pathal (Madhya Pradesh)

1.	Classification	Land preparation implement
2.	Name (English and local)	Clod crusher—Pathal
3.	Name of the State and District	Madhya Pradesh—Nagpur
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Babul wood for body and forged iron for rings
6.	Weight of the implement	130 lb. (All wooden except rings)
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	Four bullocks and two men
8.	Cost	Rs. 5 to 7
9.	Service life	10 to 15 years
10.	Usage	It is used for clod crushing and planking of the fields.
11.	Method of application	One pair of bullocks is yoked to each of the two rings fitted to the clod crusher. Two men stand on the implement to add more weight to it and control the bullocks
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nominal
14.	Work rate	2 to 3 acres in a day
15.	Cost of operation per acre	Rs. 2.50 to 3.75
16.	Whether all purpose or used for specific purpose	It is used specifically for clod crushing and levelling purpose
17.	Season of use	—
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	Very few persons own it
20.	Origin	Indian
21.	Remarks	This implement is popular in cotton tracts. Generally big land holders own it. This implement is used for clod crushing not every year but in alternate years as and when the necessity for breaking clods arises.





Sickle (Gaya) Bihar

HARVESTING IMPLEMENTS

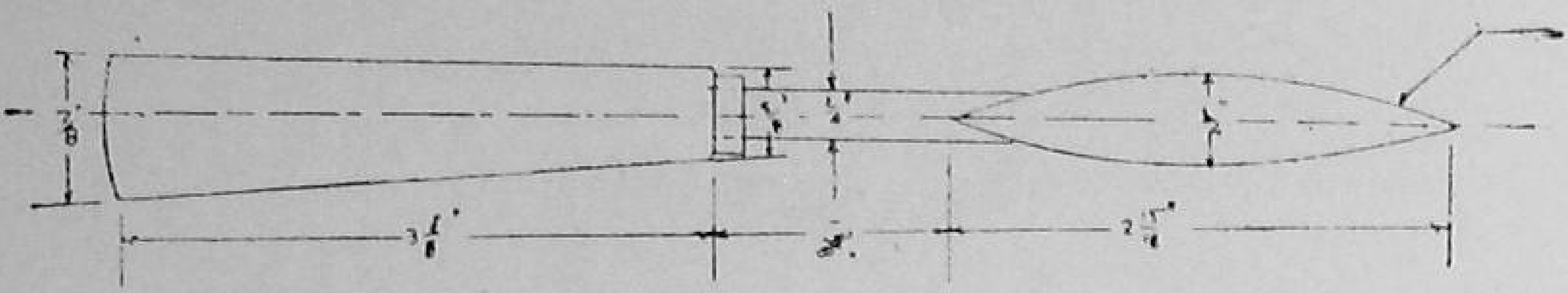
Sickle—Hasua (Bihar)

1.	Classification	Harvesting implement
2.	Name (English and local)	Sickle—Hasua
3.	Name of the State and District	Bihar—Gaya
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Scrap steel for blade and wood for handle
6.	Weight of the implement	8 to 12 oz.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One person (manually)
8.	Cost	Rs. 0.25 to 0.50
9.	Service life	One year
10.	Usage	Used for harvesting of paddy, wheat and small grain crops
11.	Method of application	The tool is held in the right hand and the crop in the left hand. The crop is cut by the movement of blade
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 0.12 only
14.	Work rate	0. 125 acre per day
15.	Cost of operation per acre	Rs. 7 to 8
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	This tool has a serrated blade and is used for harvesting of paddy, wheat, etc.

HARVESTING IMPLEMENTS

Sickle—Hasua (Bihar)

1.	Classification	Harvesting implement
2.	Name (English and local)	Sickle—Hasua
3.	Name of the State and District	Bihar—Gaya
4.	Manufacturers and source of availability	Local artisans
5.	Materials used	Scrap steel for blade and wood for handle
6.	Weight of the implement	8 to 12 oz.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One person (manually)
8.	Cost	Rs. 0.25 to 0.50
9.	Service life	One year
10.	Usage	Used for harvesting of paddy, wheat and small grain crops
11.	Method of application	The tool is held in the right hand and the crop in the left hand. The crop is cut by the movement of blade
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 0.12 only
14.	Work rate	0. 125 acre per day
15.	Cost of operation per acre	Rs. 7 to 8
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	Indian
21.	Remarks	This tool has a serrated blade and is used for harvesting of paddy, wheat, etc.

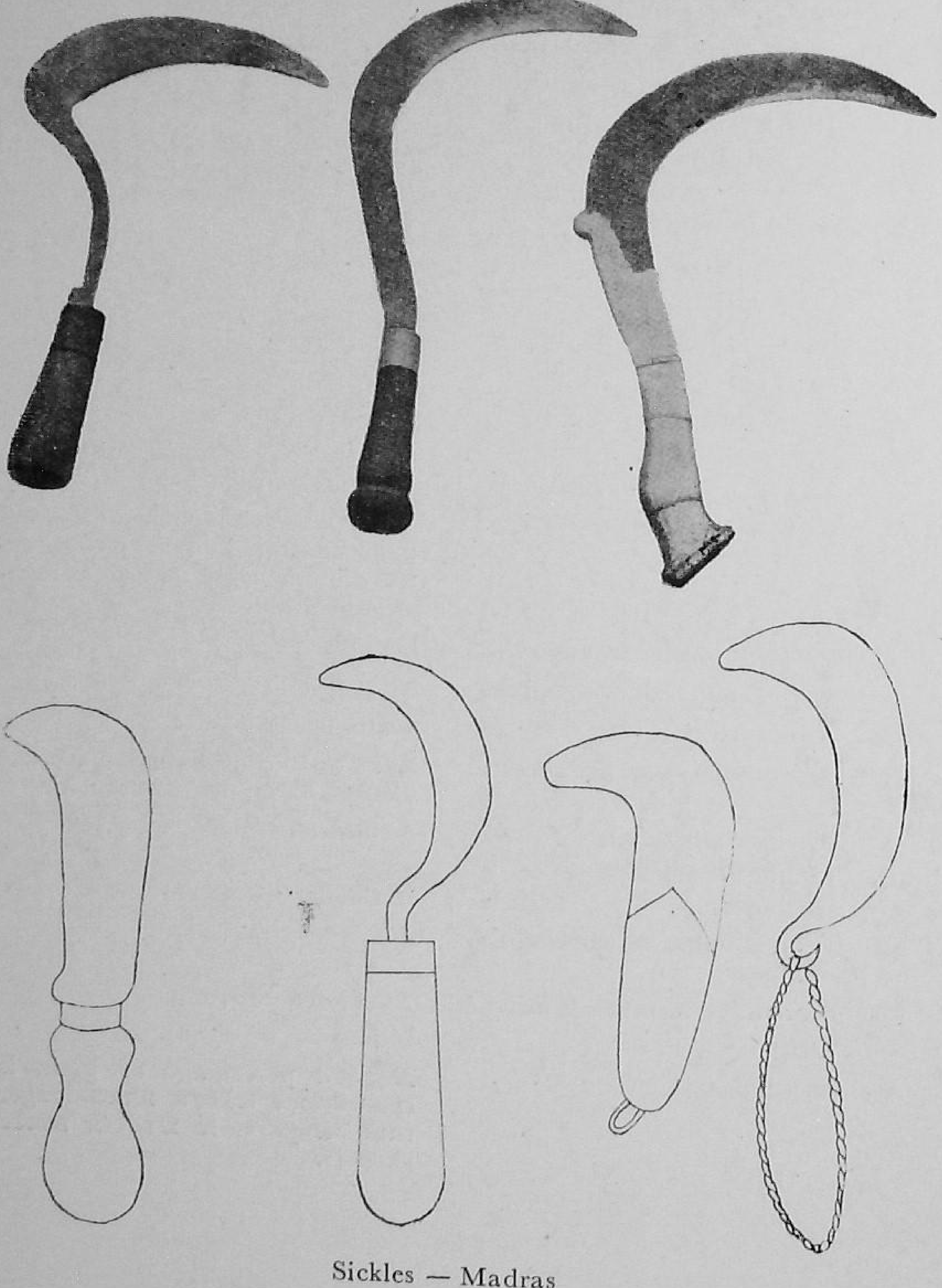


Maize Sheller (Santhal Pargana) Bihar

HARVESTING IMPLEMENTS

MAIZE SHELLER--TEKURI (BIHAR)

1. Classification	Harvesting implement
2. Name (English and local)	Maize sheller--Tekuri
3. Name of the State and District	Bihar—Santhal Pargana
4. Manufacturers and source of availability	All artisans of Turbanna and Sakkugarh
5. Materials used	Mild steel for blade and wood or bamboo for handle
6. Weight of implement	5 oz.
(i) Iron part	2 oz.
(ii) Wooden part	3 oz.
7. Operating power	One person
8. Cost	Rs. 0.12
9. Service life	2 to 3 years
10. Usage	It is used for removing the grain from maize cobs
11. Method of application	The maize cob is held in the left hand and the knife is pushed upward by the right hand to separate the grains
12. Repaired locally or otherwise	Locally
13. Annual maintenance charges	Nil
14. Work rate	40 lb. per day
15. Cost of operation per acre	Rs. 8 to 10 considering an average yield of 8 md. per acre of maize
16. Whether all purpose or used for specific purpose	As under usage
17. Season of use	In the harvesting season of maize
18. Total number of working days in a year	—
19. Percentage of farmers using it	About 100 per cent
20. Origin	Indian
21. Remarks	A good percentage of grain is spoiled and takes a much longer time compared to modern maize shellers.

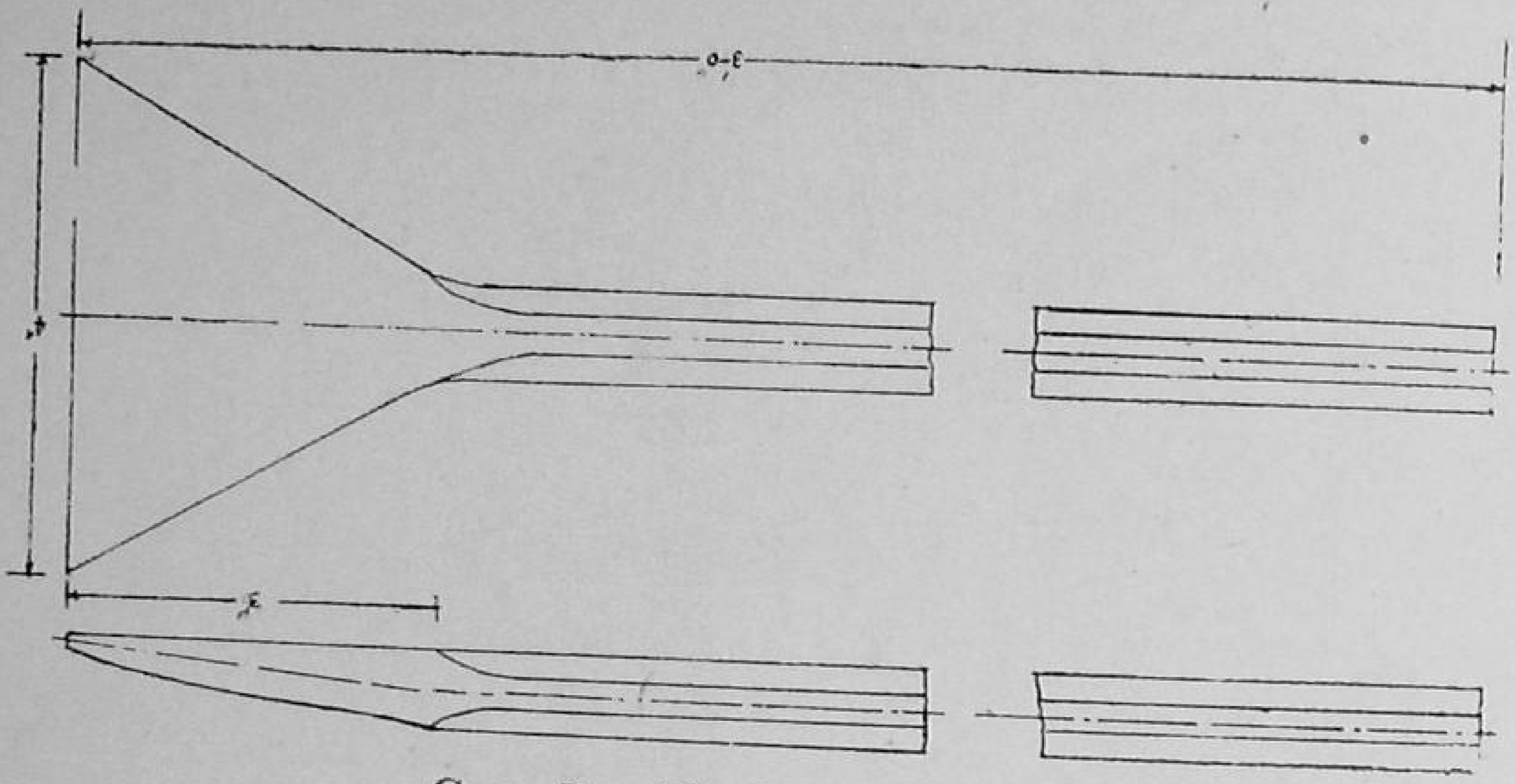


Sickles — Madras

HARVESTING IMPLEMENTS

SICKLE—ARUVAL (MADRAS)

1.	Classification	Harvesting implement
2.	Name (English and local)	Sickle—Aruval
3.	Name of the State and District	Madras—Coimbatore, Madura and Ramnad
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Wood and steel
6.	Weight of the implement	0.5 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One person
8.	Cost	Rs.0.25 to 0.50
9.	Service life	4 years
10.	Usage	It is used for harvesting *cholam* and *ragi* crops
11.	Method of application	The tool is held by the right hand and crop in the left hand. The crop is harvested by the movement of the blade
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nil
14.	Work rate	0.125 acre per day
15.	Cost of operation per acre	Rs. 8 to 9
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	In the harvesting season of *cholam* and *ragi*
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	15 to 20 per cent
20.	Origin	Indian
21.	Remarks	The stalks of millets with the earheads are cut and stacked. After a few days of drying, the earheads are cut from the stalks with these small sickles.

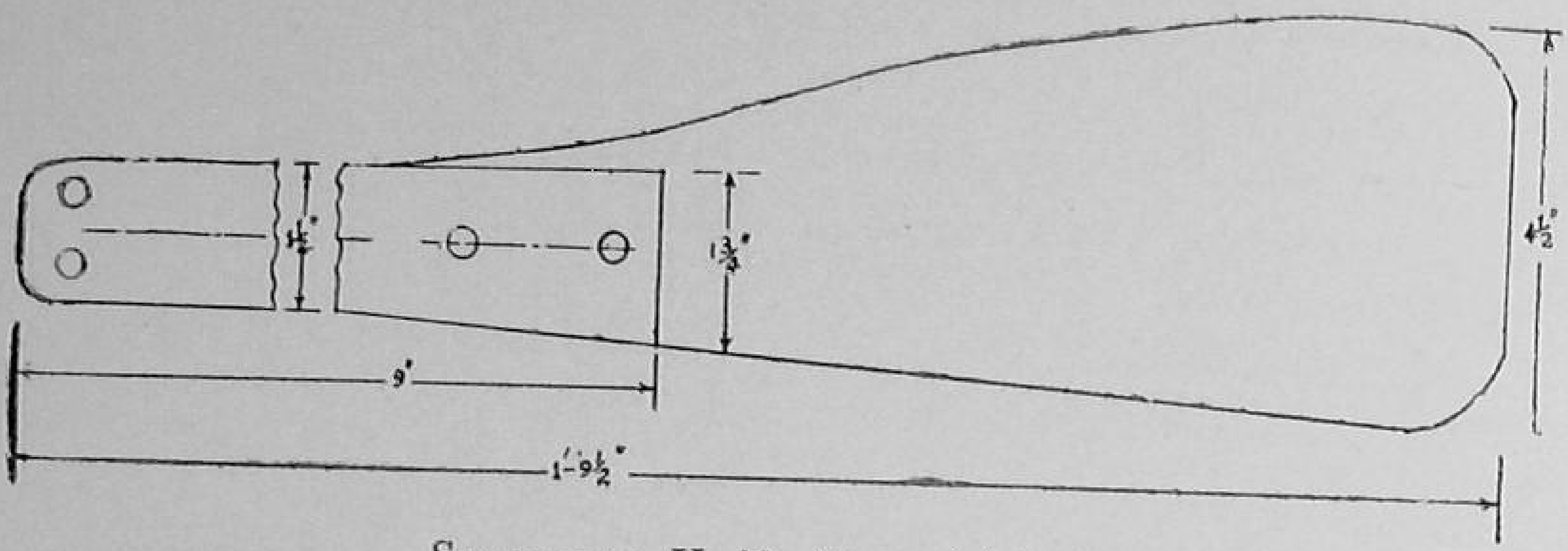


Crow Bar (North Arcot) Madras

HARVESTING IMPLEMENTS

Crow Bar—Thathai (Madras)

1.	Classification	Harvesting implement
2.	Name (English and local)	Crow bar—Thathai
3.	Name of the State and District	Madras—North Arcot
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	High carbon steel
6.	Weight of the implement	10 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One person
8.	Cost	Rs. 2 to 3
9.	Service life	5 years
10.	Usage	It is used for cutting sugarcane
11.	Method of application	The flattened end of the crow bar is knocked against the sugarcane stem by repeated strokes. The cane stem is thus cut off.
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.50 to 1.00
14.	Work rate	0.066 to 0.083 acre per day
15.	Cost of operation per acre	Rs. 15
16.	Whether all purpose or used for specific purpose	For harvesting of sugarcane specifically
17.	Season of use	All the year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 20—30 per cent
20.	Origin	Indian
21.	Remarks	—

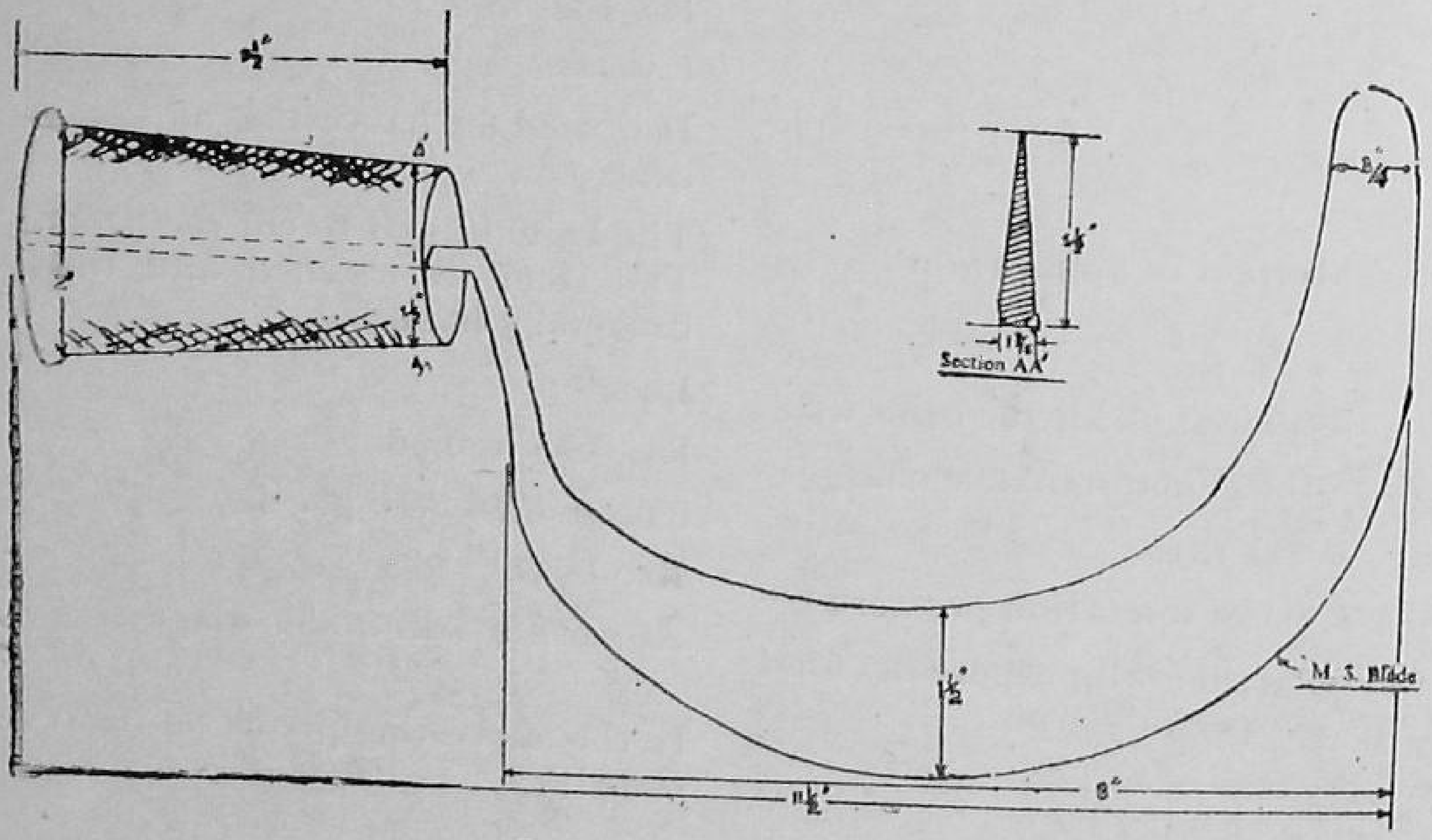


Sugarcane Knife (Arcot) Madras

HARVESTING IMPLEMENTS

Sugarcane Knife—Aruval (Madras)

1. Classification	Harvesting implement
2. Name (English and local)	Sugarcane knife – Aruval
3. Name of the State and District	Madras -- South and North Arcot, Coimbatore and Trichy
4. Manufacturers and source of availability	Village artisans
5. Materials used	Carbon steel (for blade)
6. Weight of the implement	2 to 3 lb.
(i) Iron part	—
(ii) Wooden part	—
7. Operating power	One person
8. Cost	Rs. 1.50 to 2
9. Service life	5 years
10. Usage	It is used for harvesting of sugarcane, etc.
11. Method of application	The knife is used to cut the stem. The stem is notched and then broken by handling
12. Repaired locally or otherwise	Locally
13. Annual maintenance charges	Rs. 0.25 to 0-50
14. Work rate	0.05 to 0.66 acre per day
15. Cost of operation per acre	Rs. 18.75
16. Whether all purpose or used for specific purpose	As per remarks under usage
17. Season of use	In the harvesting period of sugarcane
18. Total number of working days in a year	—
19. Percentage of farmers using it	5 to 10 per cent
20. Origin	Indian
21. Remarks	This tool is fitted with a straight steel blade.



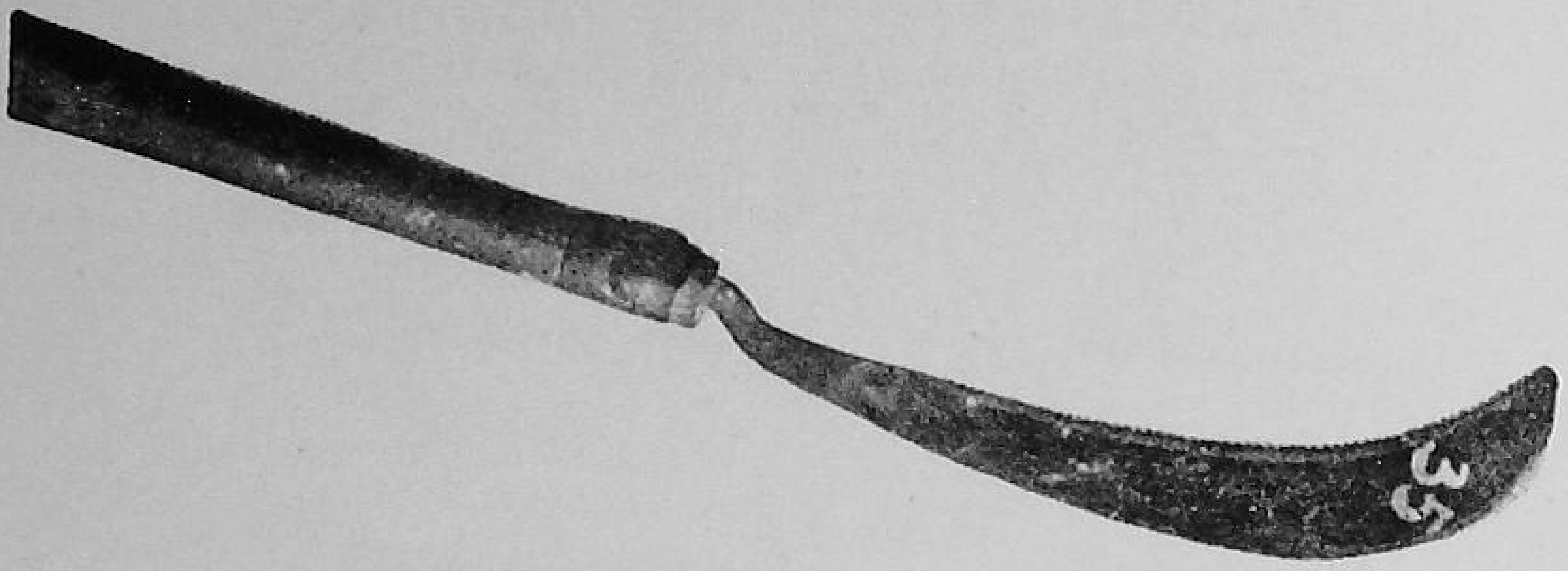
Sickle — Rajasthan

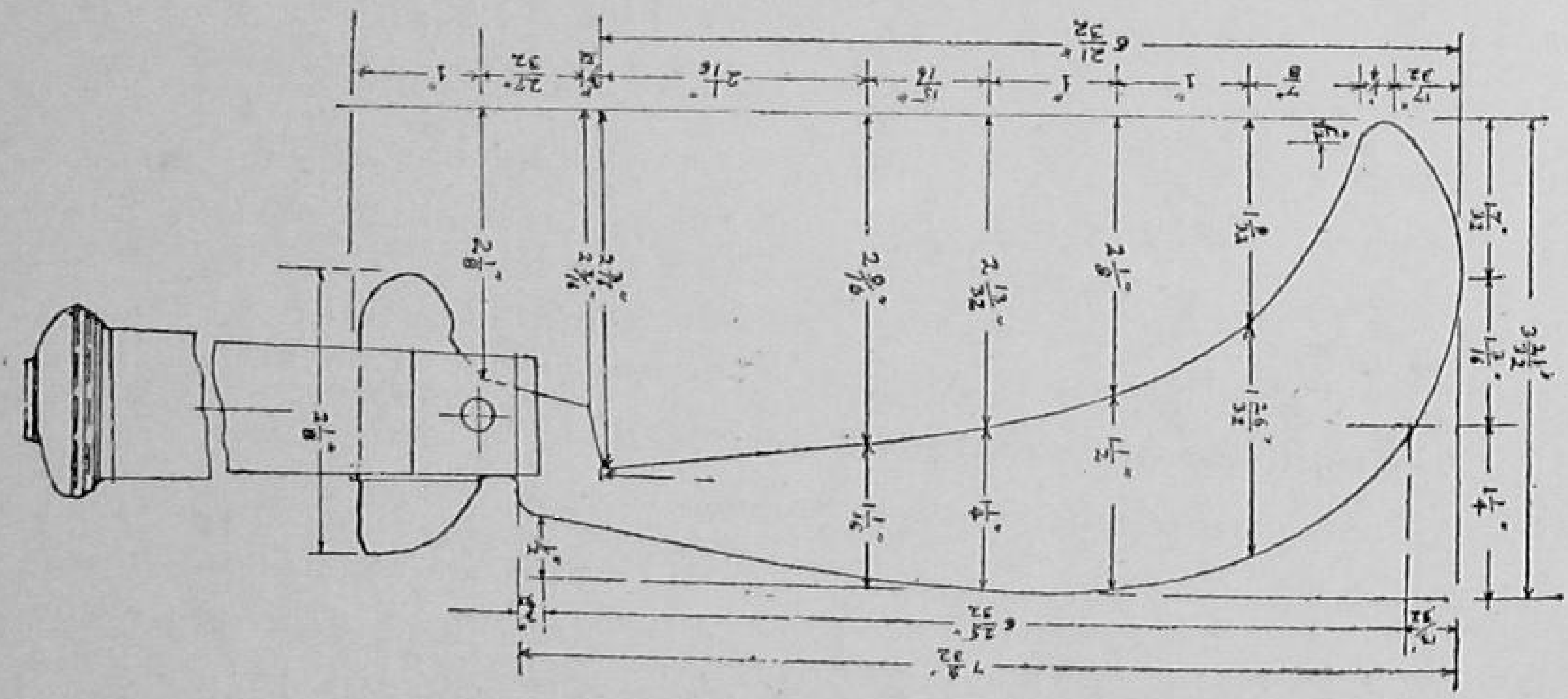
HARVESTING IMPLEMENTS

Sickle—Dranti (Rajasthan)

1.	Classification	Harvesting implement
2.	Name (English and local)	Sickle—Dranti
3	Name of the State and District	Rajasthan—Dungarpur and Banswara, Kota, Tonk, Udaipur, Bharatpur, Jhalawar, Sawai Madhopur, Alwar, Bundi, Chittorgarh, and Jaipur*
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Wood for handle and mild steel for blade
6.	Weight of the implement	1 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One person
8.	Cost	Rs. 1.00 to 1.50
9.	Service life	2 to 3 years
10.	Usage	It is used for harvesting crops
11.	Method of application	The tool is held in the right hand and the handful of crop in the left hand. The crop is cut by the movement of the blade
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Nil
14.	Work rate	480 to 880 lb. of standing crop or about 0.125 acre per day
15.	Cost of operation per acre	Rs. 6 to 7
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 100 per cent
20.	Origin	India
21.	Remarks	—

* An identical type of sickle is reported from the following localities: (1) Gorakhpur, Azamgarh, Aligarh of Uttar Pradesh; (2) throughout the State of West Bengal; (3) Amreli Kohlapur, Panchmahal of Bombay State; (4) Sambalpur District of Orissa State; (5) Malabar and South Kanara, Tanjore, South and North Arcot, Chingleput Districts of Madras State; (6) Coorg and Himachal Pradesh; (7) Purnea District of Bihar State and (8) Andhra State.





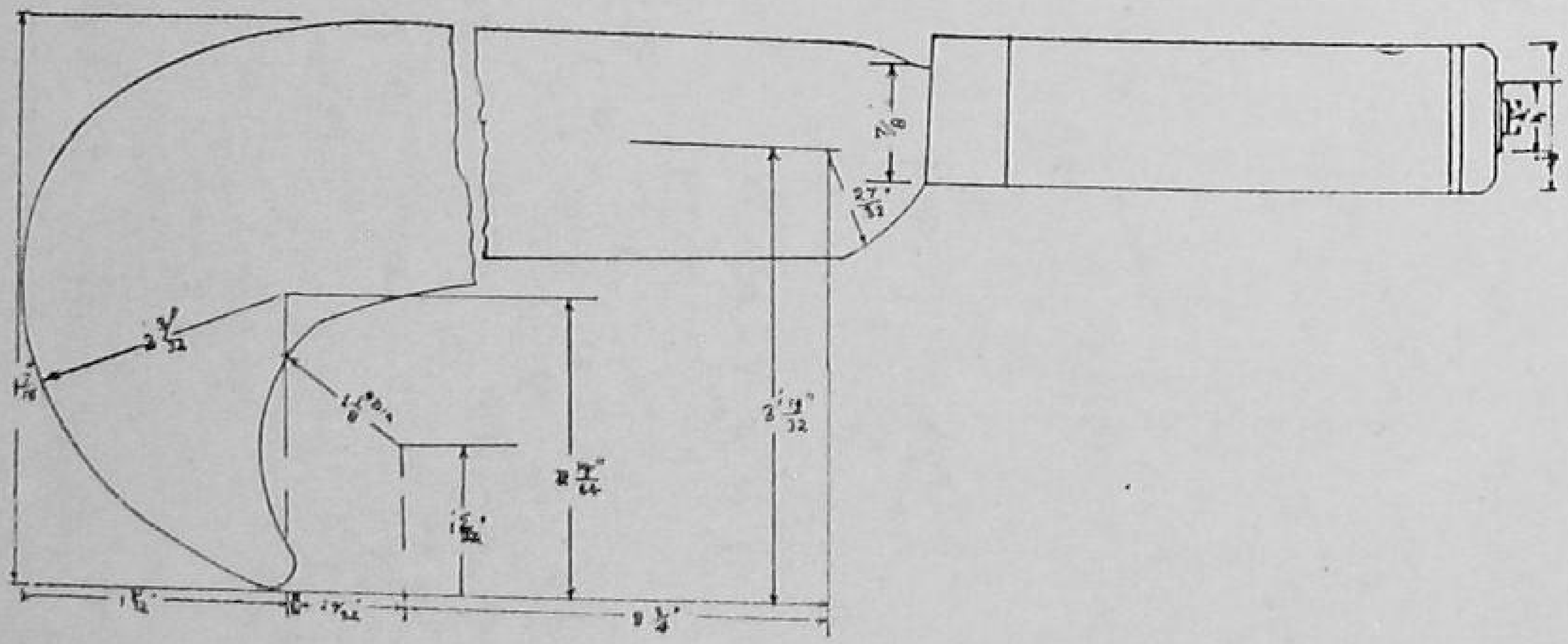
Sickle (Meerut) Uttar Pradesh

HARVESTING IMPLEMENTS

Sickle—Darati (Uttar Pradesh)

1.	Classification	Harvesting implement
2.	Name (English and local)	Sickle—Darati
3.	Name of the State and District	Uttar Pradesh—Meerut, Gorakhpur *
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Wood and mild steel
6.	Weight of the implement	0.5—1.00 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One person (manually)
8.	Cost	Rs. 0.50 to Rs. 1.00
9.	Service life	2 to 3 years
10.	Usage	It is used for harvesting of tall growing crops
11.	Method of application	The tool is held in the right hand and crop in the left hand. The crop is harvested by the movement of the blade
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.50
14.	Work rate	0.125 acres per day
15.	Cost of operation per acre	Rs. 14
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	All the year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using i	—
20.	Origin	Indian
21.	Remarks	—

* A similar type of sickle is reported from the following localities : (1) throughout the Rajasthan State ; (2) Coimbatore, Salem, Trichy, Madura, Ramnad; Tinnevelly Districts of Madras State and (3) Bhagalpur, Ranchi, Purnea, Manbhum, Gaya Districts of Bihar State.

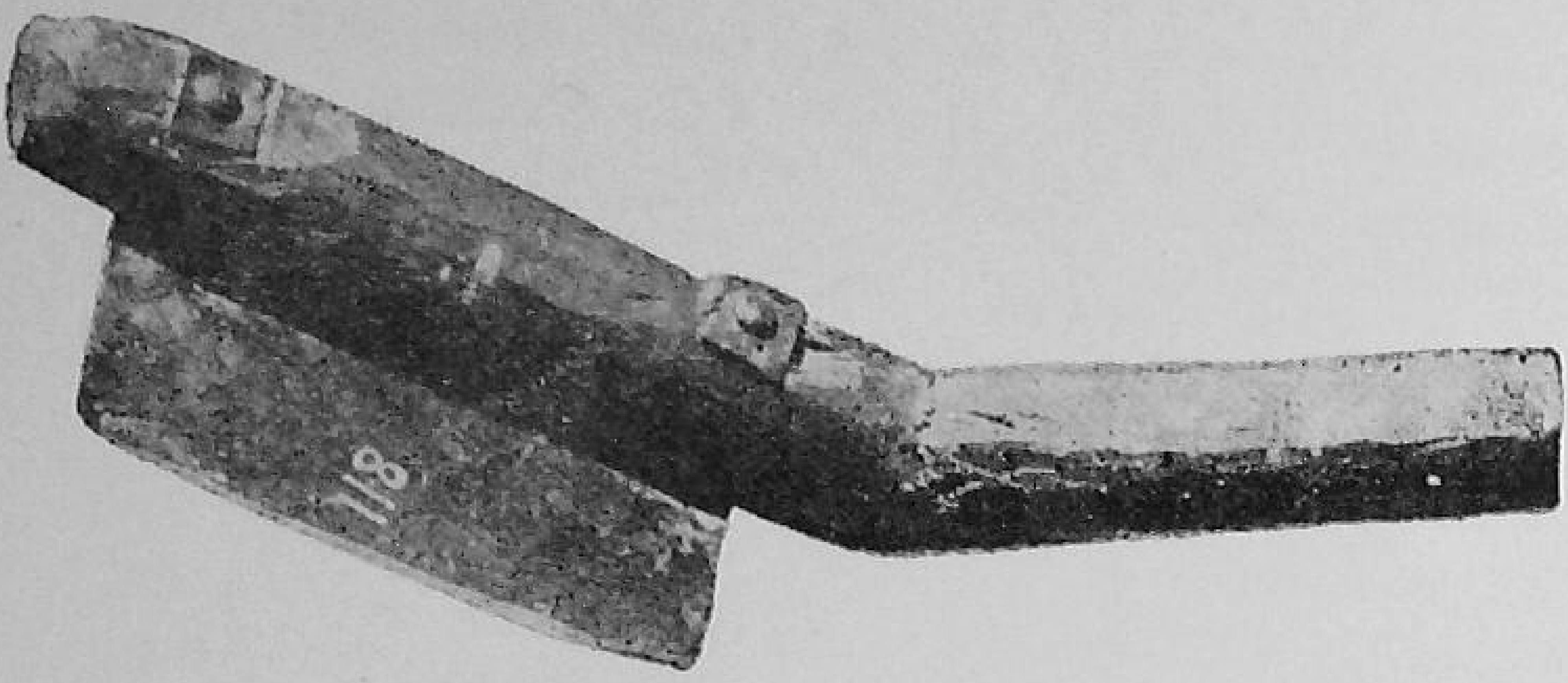


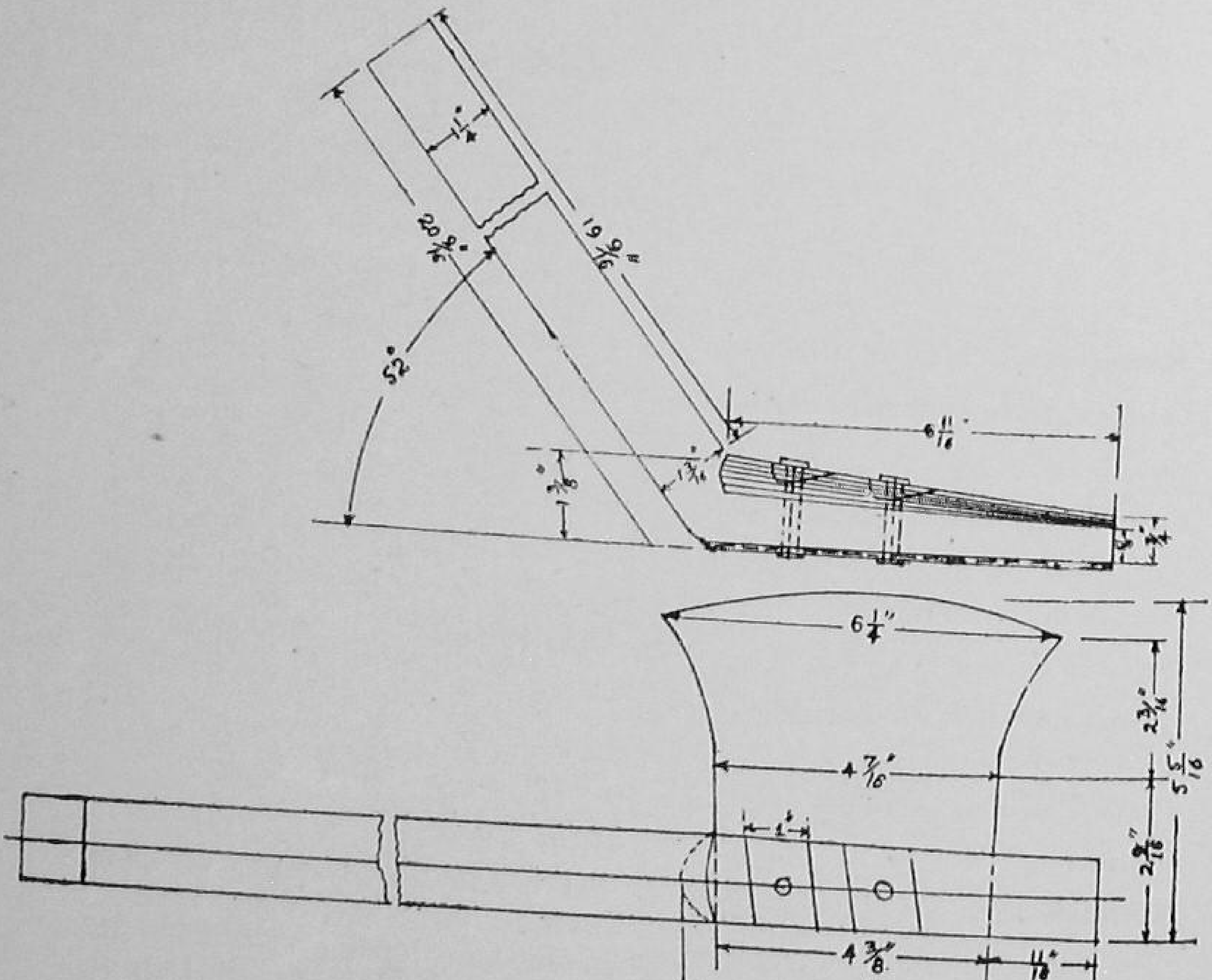
Sickle (Dehra Dun) Uttar Pradesh

HARVESTING IMPLEMENTS

SICKLE —PALAT (UTTAR PRADESH)

1.	Classification	Harvesting implement
2.	Name (English and local)	Sickle—Palat
3.	Name of the State and District	Uttar Pradesh—Dehra Dun
4	Manufacturers and source of availability	Village artisans
5.	Materials used	Wood and mild steel
6.	Weight of the implement	1.25 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One person
8.	Cost	Rs. 1.25 to 1.50
9.	Service life	3 to 4 years
10.	Usage	It is used for harvesting of sugarcane
11.	Method of application	A man holds the tool in the right hand and strikes at the root of the stem thus cutting it in one stroke. The man works either in sitting or standing position
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Rs. 1.00
14.	Work rate	0.104 acre per day
15.	Cost of operation per acre	Rs. 15 to 20
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 50 per cent
20.	Origin	Indian
21.	Remarks	The blade of this sickle is unserrated. An identical type of sickle has been reported from Sikar and Jhunjhunu Districts of Rajasthan State.



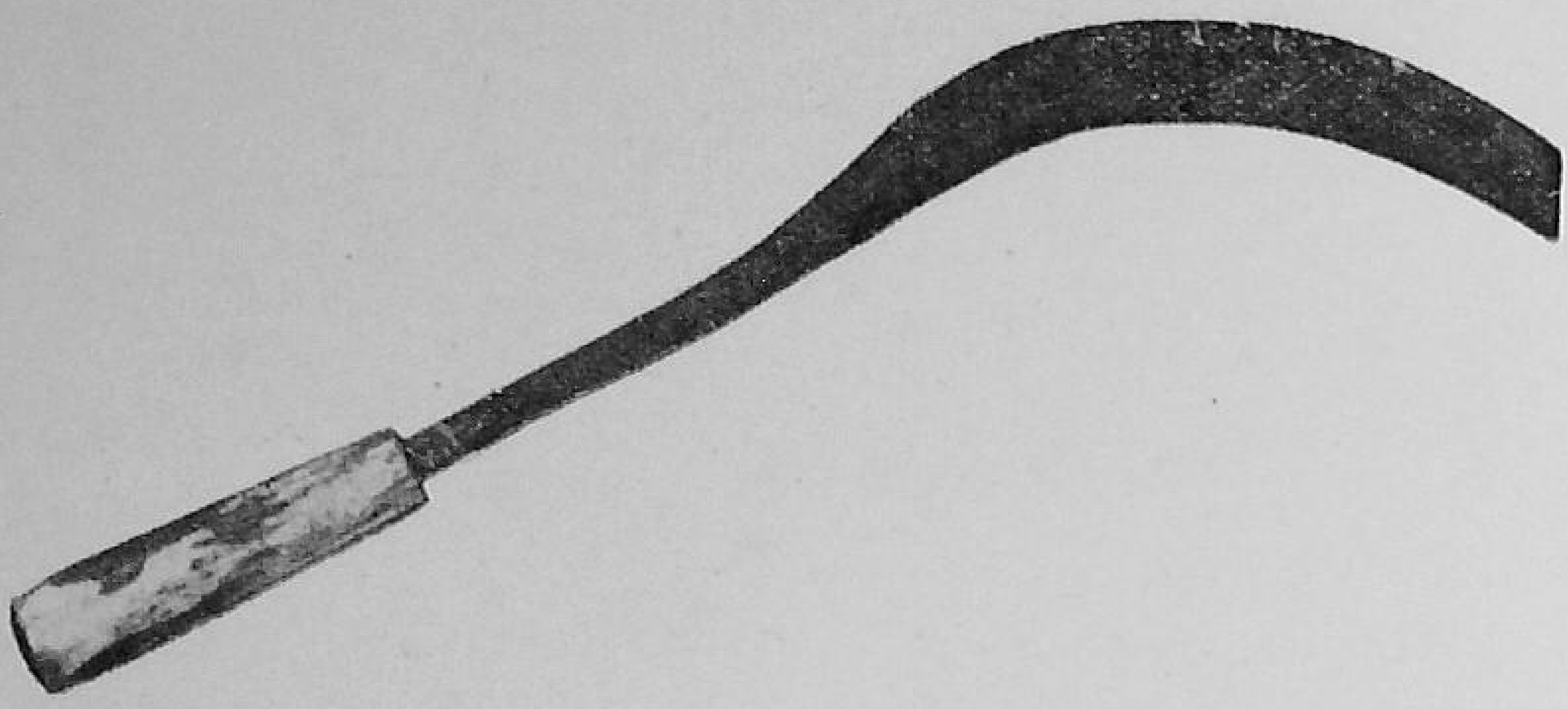


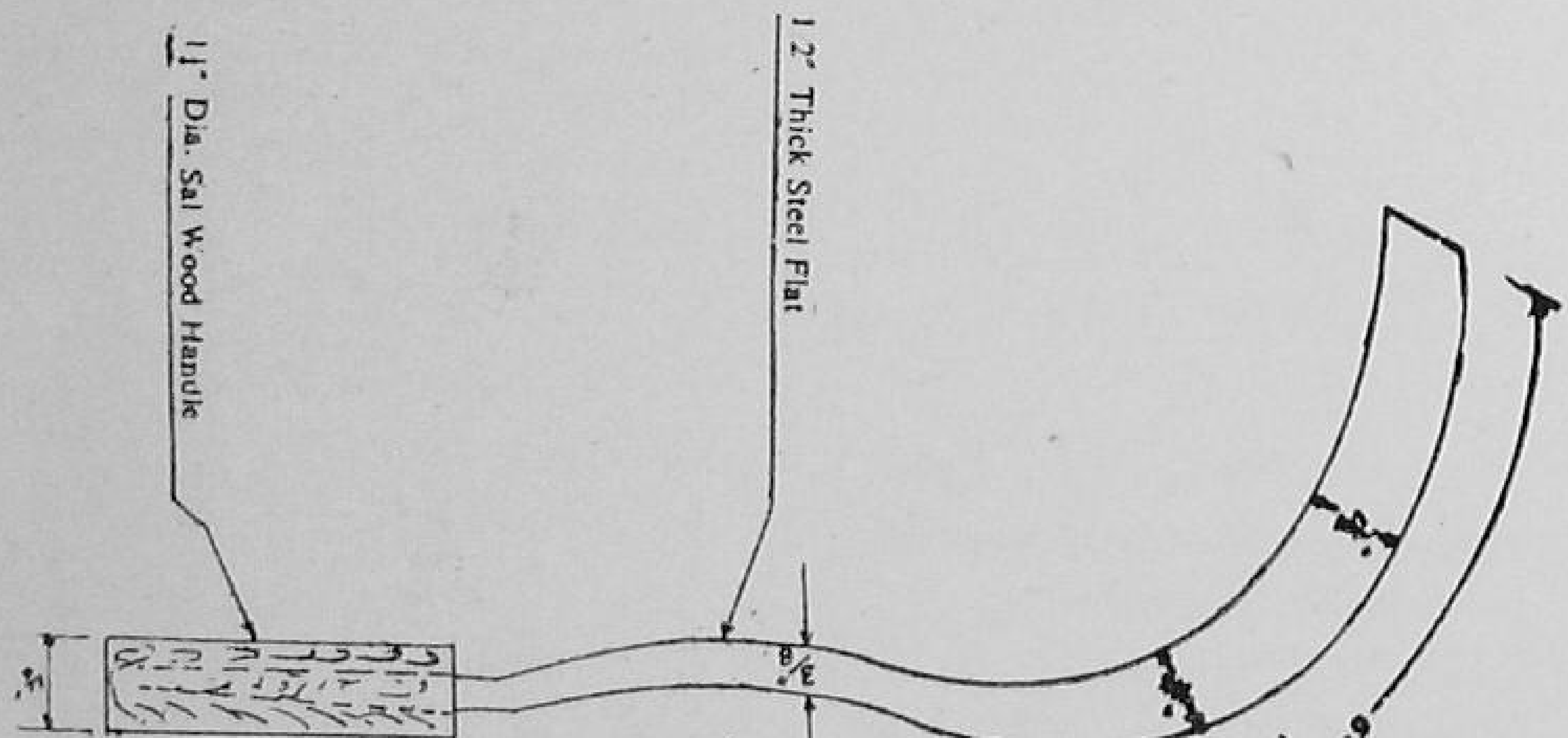
Chopper (Meerut) Uttar Pradesh

HARVESTING IMPLEMENTS

Chopper—Balkati (Uttar Pradesh)

1.	Classification	Harvesting implement
2.	Name (English and local)	Chopper—Balkati
3.	Name of the State and District	Uttar Pradesh—Meerut
4.	Manufacturers and source of availability	Village artisans
5.	Materials used	Wood for handle and mild steel for blade
6.	Weight of the implement	2 lb.
	(i) Iron part	—
	(ii) Wooden part	—
7.	Operating power	One person
8.	Cost	Rs. 1.50 to 2
9.	Service life	5 years
10.	Usage	It is used for harvesting of sugarcane
11.	Method of application	The person holds the implement in the right hand and strikes at the root of the the stem of sugarcane thus cutting it in one stroke
12.	Repaired locally or otherwise	Locally
13.	Annual maintenance charges	Re. 0.50
14.	Work rate	0.40 acre per day of 8 hours
15.	Cost of operation per acre	Rs. 4 per acre
16.	Whether all purpose or used for specific purpose	As per remarks under usage
17.	Season of use	Year round
18.	Total number of working days in a year	—
19.	Percentage of farmers using it	About 50 per cent
20.	Origin	Indian
21.	Remarks	—



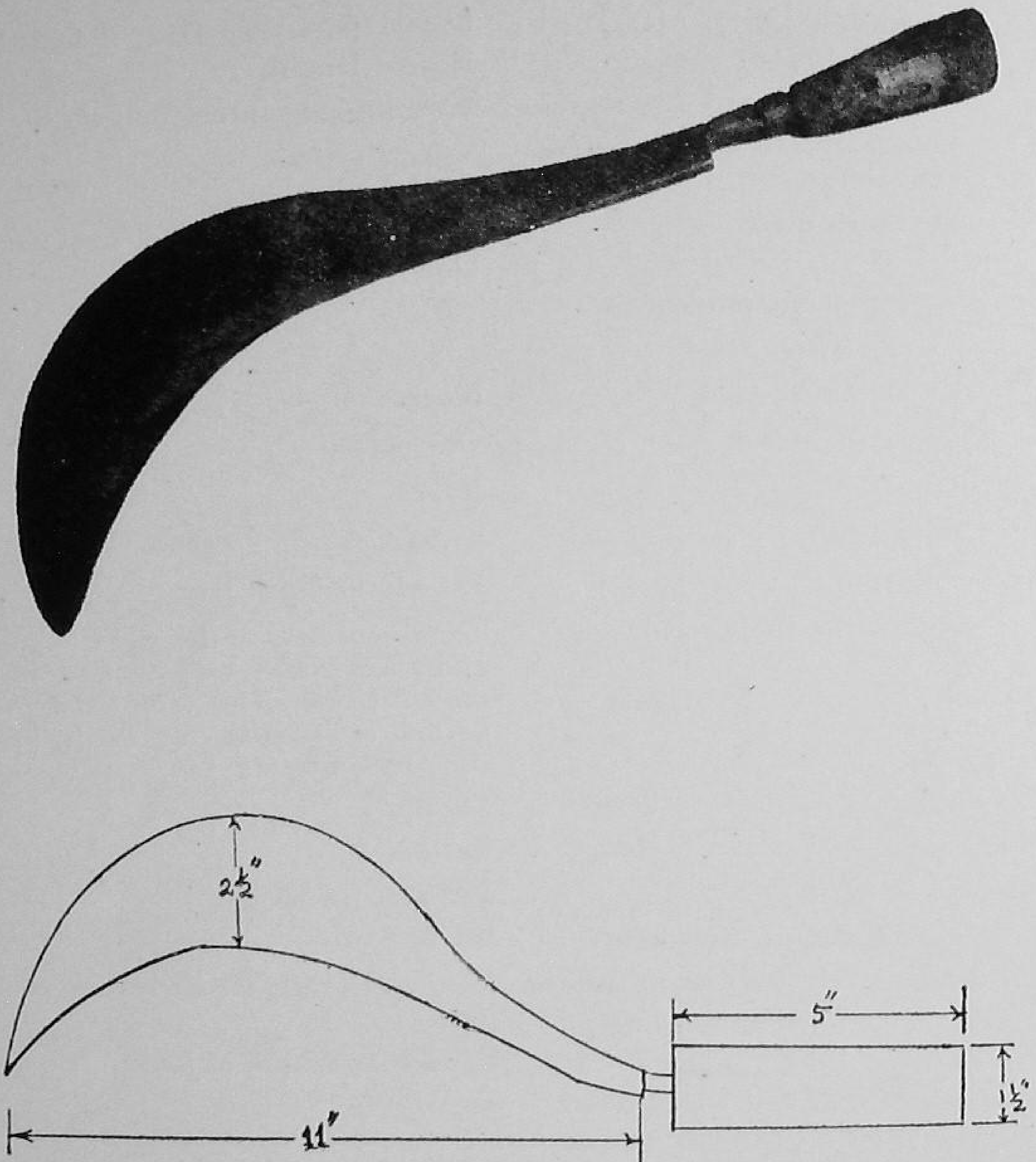


Sickle (West Bengal)

HARVESTING IMPLEMENTS

Sickle—Pata-Kata-Daw, Hasua (West Bengal)

1. Classification	Harvesting implement
2. Name (English and local)	Sickle—Pata-Kata-Daw (Bengali) Hasua (Hindi)
3. Name of the State and District	West Bengal—throughout the State
4. Manufacturers and source of availability	Village artisans
5. Materials used	Wood for handle, mild steel for blade
6. Weight of the implement	1.5 lb.
(i) Iron part	1 lb.
(ii) Wooden part	0.5 lb.
7. Operating power	One person
8. Cost	Rs. 2
9. Service life	3 years
10. Usage	For harvesting of jute
11. Method of application	The tool is held in the right hand and a handful of crop is held in the left hand. The crop is harvested by striking the blade at the roots of stems
12. Repaired locally or otherwise	Locally
13. Annual maintenance charges	Re. 1.00
14. Work rate	0.23 acre per day
15. Cost of operation per acre	Rs. 8.75
16. Whether all purpose or used for specific purpose	Used specifically for harvesting of jute
17. Season of use	Harvesting season of jute
18. Total number of working days in a year	—
19. Percentage of farmers using it	About 100 per cent in jute growing region
20. Origin	Indian
21. Remarks	It is not a serrated type. The blade requires frequent sharpening during the harvesting season as mild steel is used for its construction.



Chopper—West Bengal

HARVESTING IMPLEMENTS

Chopper—Daw (West Bengal)

1. Classification	Harvesting implement
2. Name (English and local)	Chopper—Daw (Bengali)
3. Name of the State and District	West Bengal—Throughout the State
4. Manufacturers and source of availability	Local artisans
5. Materials used	Mild steel for blade and wood for handle
6. Weight of the implement	3 lb.
(i) Iron part	2.5 lb.
(ii) Wooden part	0.5 lb.
7. Operating power	One person
8. Cost	Rs. 3
9. Service life	4 years
10. Usage	For harvesting of sugarcane, banana and bamboo
11. Method of application	The tool is held by handle in the right hand and by a chopping action of the tool the crop which is held by the left hand is harvested.It is operated while standing
12. Repaired locally or otherwise	Locally
13. Annual maintenance charges	Re. 1
14. Work rate	0.16 acre per day
15. Cost of operation per acre	Rs. 12.50
16. Whether all purpose or used for specific purpose	Used specifically for harvesting sugarcane, banana and bamboo
17. Season of use	All the year round
18. Total number of working days in a year	—
19. Percentage of farmers using it	About 100 per cent
20. Origin	Indian
21. Remarks	—

APPENDICES

APPENDIX I

RECOMMENDATIONS

All the indigenous implements included in the survey are mostly manufactured locally by village artisans. The total number of the types involved is not, however, accurately known.

Although the implements differ considerably in details, the basic types are comparatively few, and their number could be reduced for standardisation purposes. Consequently, there is scope for studying the existing types of indigenous implements and evolving a few similar and integrated basic type designs, suitable for varying Indian fields and soil conditions.

It is seen from the study of the data gathered during this survey that the main problem in the fabrication of indigenous implements is that the sizes and shapes of parts are not according to any standard. The work of improvement, development and standardisation of indigenous implements should be carried out in a co-ordinated manner with due regard to the different soils, climatic conditions and cultural practices in the various regions of the country. The general recommendations in this respect are as follows :

1. Field trials should be conducted systematically and reported on standard proforma so that the value of results obtained would not be vitiated either through lack of proper procedure, omission of some important data or spot observation. Keeping in view the wide scope of these trials, it is essential that the test results are reviewed from time to time and the trials altered or modified accordingly.

2. The implements which have been successful in one region should be tried out in other regions with a view to adopting them with or without modification in those regions.

3. Promising types of foreign implements, particularly the animal-drawn ones, should also be tried out under various soil and climatic conditions in different regions of the country with a view to evolving successful designs incorporating the desirable features of the foreign and indigenous implements which are useful. Manually operated foreign implements such as, hand hoes, spades, scythes and sickles should also be studied technically for similar reasons.

4. Angles of the cutting blades, working points as well as angle of attachments of handles and methods of attachments deserve closer study with a view to improving the structural strength, working

efficiency and ease of operation of the implements.

5. Research should be undertaken on the animal yokes and methods of hitching with a view to improve their working efficiency. Multiple teams of animals controlled by one man are not commonly used in this country. It is a well-known fact that in the Western countries multiple teams of horses or mules are quite often controlled by a single driver, and even tractor drawn implements are thus operated, using animal power. In India every pair of animal invariably requires an independent driver and an animal team working with one driver is practically unknown. Research to evolve suitable methods using multiple teams of animals under the control of a single driver should, therefore, be undertaken.

6. Multiple purpose implements should be evolved wherever possible so that a single implement with suitable attachment or modifications could be used to cover as wide a variety of operations as possible. The efforts in developing bullock-drawn tool carrier-cum-farm-cart is of interest in this context.

7. A committee should be set up to take up the question of standardization of the shapes and sizes of the components of approved agricultural implements in order to enable at least some of these to be manufactured on a mass scale so that they are readily and cheaply available to the cultivators. This committee should also lay down standard specifications of the materials to be used and proper heat-treatment processes to be adopted for the various working parts. This work should be done in consultation with the Indian Standard Institute.

This committee should also lay down standard economical sizes for various wooden parts. Since the advantages of mass production can only be obtained when the consumption of the parts is sufficiently large, the committee should also assess the demands for these parts on a realistic basis.

8. Although at present a large percentage of working force of this country is employed in agriculture, with progressive industrialisation there will be a shift of population to non-agricultural channels of employment. This trend in the long range will mean that farming methods will be affected. The design of the improved implements should, therefore, be progressive and flexible for effective saving of time and drudgery.

9. The implements should be capable of being repaired by the farmers, with the help of the local village artisans.

Study of the data pertaining to individual types of implements leads to the following observations :

PLOUGHS

Although several types of ploughs have been reported in the course of this survey; they could be categorised as below :

(i) Heavy duty plough, for summer ploughing particulary in black soil

(ii) Ploughs for dryland farming

(iii) Ploughs for farming under irrigated conditions

(iv) Ploughs for wetland cultivation

Heavy Duty Ploughs. One of the reasons for summer ploughing is the formation of hard pan or the plough sole. There is considerable scope here for evolving suitable types of mould board ploughs. Some well known implement manufacturers are currently manufacturing heavy duty ploughs of this kind.

Ploughs for Dryland Farming. Requirements of ploughs for dryland farming all over the country, with particular reference to the size and strength of the bullocks available locally could be met by following three types :

(1) Large, (2) Medium, and (3) Small.

The present large number of different types of ploughs used for dryland farming should be classified under one of the above categories and then taken up for improvement to fit in with the requirements of those categories.

As burial of crop residues is not generally practised in dry farming areas, mould-board type of furrow turning ploughs are not essential under these conditions. The Mannargudi plough reported from Madras which has an all steel bottom bolted directly on to the beam would probably prove useful.

Ploughs for Farming under Irrigated Conditions. Since green manuring is largely practised in irrigated farming there is need to introduce and popularise furrow turning mould board ploughs. In view of the importance of maintaining field levels a turn-wrest plough could be usefully popularised in these areas. A simple light and cheap turn-wrest plough for bullock operation is a necessity for agriculturist in this country.

Ploughs for Wetland Cultivations. Ploughs capable of working in standing water and puddling simultaneously are required for wetland cultivation. Where there is sufficient time available for transplanting, the practice is to plough in the green manure, puddling being taken up later. Where sufficient time is not available for the green manuring, the field is straight away puddled by repeated ploughing with the indigenous plough itself.

Mention may be made here of the Melur or Bose plough (DRG. 11) and the all-iron plough (DRG. 10) from Tanjore District of

Madras State which have some desirable features and these deserve to be taken up for improvement.

HARROWS

The working angles of the tyned harrows and their attachment to the head piece need to be studied for assessing whether the present arrangements are optimum or require modifications.

It is observed that the harrows in use at present do not have the facility of changing the tyne spacing and width of cut. A design incorporating this facility is considerd desirable.

Breakage of the beam frequently occurs at or near the joints. This is particularly noticeable in blade harrows. This weakness should be eliminated by improvements at the joints.

The blades of blade harrow are mostly made of mild steel. They wear out and become blunt quickly. Their life can be increased by using high carbon steel.

Though the blade harrow eradicates weeds and stumps efficiently, it dose not collect them. Since their subsequent collecttion requires additional man power and expenditure, some arrangement on this implement should be devised to collect weeds and stumps.

Often the harrows do not penetrate well due to hard soil and relative lightness of the implement. More weight is added to the implement when working under such conditions. Some arrangements of changing the working angle of the blade to suit the field conditions may improve working.

HOES

Hand Hoes. There are several hand hoes in use which require a stooping or squatting position which is not only deterimental to output but also very tiring to the operator. There is need for replacement of all such implements with improved ones allowing a more comfortable working posture.

A systematic study of the sizes and shapes of handles vis-a-vis the blade sizes and shapes for various operations such as digging, ridging and interculture is necessary.

There is also need to study the relationship between blade working angles in the soil and inclination of the handle; and the direction of the line of pull with reference to the centre of resistance in the soil.

The socket design and connection of the handle could be studied with advantage and improved types of connections and fittings evolved to guard against sliping and loosening of the handle.

The use of rolling wheel type hand hoes is reported to be popular in some areas on account of their higher work capacity and ease

of operation. There is need to study such promising types under field conditions and for their popularisation in other areas.

There is need to study the materials of construction particularly steel for blades and to lay down standard specifications of materials and methods of heat treatment in order to improve durability, performance and resistance to wear and tear of the implements.

It is observed that the action of hand hoes is discontinuous. There appears to be a need to evolve a type of hand hoe which could be pushed along the rows continuously with greater speed of working.

Animal Drawn Hoes. As the animal drawn hoes find great utility in intercultural operations and earthing-up of ridges in row-crop cultivation, there is need for studying the blade sizes and angle of inclination, to obtain better penetration, depth-control and lower draft resistance. As the blades require frequent cleaning, a self cleaning type of blade, would be a desirable improvement.

In view of the varying spacings prevalent for different crops, a suitable hoe with adjustments for crop spacings and heights should be evolved. At present crop spacing in indigenous types of hoes is fixed, and does not admit of adjustment.

Introduction of hoes found useful in one tract may prove useful with or without modifications in other areas.

SEED DRILLS

There are no adjustments provided in the existing types of indigenous seed drills to vary the spacing between rows. It would be advantageous to have such an adjustment.

There is no adjustment to change the seed rate. The rate of seed sown per acre is controlled by the judgement and skill with which the operator drops seed into the seed-cups. This method results in non-uniform sowing. There is, therefore, need to provide some device in the indigenous seed drills to control the seed rate automatically. This will lead to economy in seed.

There is need to evolve proper type of furrow openers to suit different soil conditions.

No State has reported any seed drill which can sow mixed crops. A seed drill which can sow more than one crop simultaneously is needed.

Indigenous seed drills have no arrangements to cover the seeds and compact the soil after drilling. An improved seed drill must provide for proper placement, effective covering of the seed, and compaction of soil in the furrows over the seeds.

In existing indigenous drills, there is no arrangement to vary the depth of sowing, apart from what can be obtained by varying the

hitching point. The depth of sowing of seeds is related to the crop, soil and moisture conditions. A seed drill with variable depth control is desirable.

The seeding mechanism should not damage the seeds.

A design of an improved seed drill should be such as can be repaired by village artisans. It should have a reasonable life consistent with cost of fabrication.

There is need for a combined seed drill-cum-fertilizer placement machine. The machine should place the fertilizers and seeds in such a manner as to avoid their coming into contact with each other.

Patterns of indigenous seed drills found successful in one State could be advantageously popularised in other States. In the Eastern Zone, namely the States of Assam, Bihar, Orissa, West Bengal and also in the States of Punjab, Himachal Pradesh and Uttar Pradesh there are no indigenous seed drills for sowing *rabi* crops which can drill more than two rows at a time, whereas, multiple row seed drills are regularly used in Madhya Pradesh, Andhra, Mysore, Madras and Bombay.

The survey has not revealed any device for dibbling seeds. Along with the research work on seed drills, work on development of seed dibbler should be undertaken.

Bombay has reported an interesting type of planter for planting sugarcane setts. This planting machine may be tried in other sugarcane growing tracts for determining its suitability.

CLOD CRUSHERS, ROLLERS, LEVELLERS, RIDGERS AND HARVESTING IMPLEMENTS

The planks in certain States notably in Punjab, Rsjasthan and Uttar Pradesh do not usually have handles. The provision of a handle on a plank as in Mysore, Madras, and Hyderabad will facilitate proper control in levelling operations.

Tandem-log- clod-crushers are more effective in breaking clods. Such types are in use in some parts of Uttar Pradesh and Vindhya Pradesh.

Use of levellers and rollers is not common in dryland farming in Rajasthan, Uttar Pradesh, Bengal, Assam, Bihar and Madhya Bharat. There is need to evolve suitable types of levellers and rollers to suit these areas. Introduction of some of the types of levellers in use in Madras, Punjab and Orissa may be tried.

The main function of a roller is to crush the clods and compact the soil surface. A roller with corrugations and grooves is more effective in crushing the clods than a plain roller. If rolling is done across the slope the cross corrugations formed will be helpful in

soil erosion control.

In view of a very large irrigation programme all over India, under the Plan Projects cultivation will require not only construction of water channels, but also adoption of ridge and furrow method of irrigation in growing some of the principal crops. There is accordingly need for designing a cheap and efficient ridger. Similarly, there is need for an attachment to convert a plough into a ridger. It would also be desirable to have a planting attachment to a ridger for use whenever planting is to be done.

Harvesting is carried out in India with manual labour. The labour force required for harvesting is so great that there is a serious shortage during harvesting season in many parts of India, and it has been the practice for labour caravans particularly from Rajasthan to move round the neighbouring regions of Madhya Pradesh and Uttar Pradesh. Similar seasonal labour migrations are also prevalent in the coffee plantations in Malnad area of Mysore. Labourers invariably demand high wages during the harvest period and thus harvesting becomes a costly operation.

The most commonly used implement for harvesting is the ordinary sickle. Its use in its present form is a time and labour consuming process. There is accordingly pressing need to evolve some other suitable harvesting tool similar to a scythe of the Western type. This latter type of tool is operated in a standing position and enables larger crop areas to be harvested, as compared to that of a sickle. The greatest difficulty in popularising this Western implement in this country has been that its use besides calling for a special technique involves a change in the working posture.

While evolving any new implement for harvesting, the requirements of the crops of the two main seasons, the *kharif* and *rabi*, should be kept in view.

Bullock reapers are reported to be in use on big private and Government farms. If holdings are consolidated and the fields are made regular and bigger in size, the bullock reaper will perhaps prove to be a more practicable solution.

DEVELOPMENT AND EXTENSION

One of the main objectives of this Survey was to collect basic information of existing indigenous implements with a view to study the possibility of their improvement and later on their introduction throughout the country for improving efficiency of agricultural operations and thereby achieving increased food production. It has been the experience in the past that, even after a good implement was evolved, it did not reach the cultivators and could not be popularised among them. The main reason behind this, seems to be the lack

of properly organised Extension Work and adequate efforts on the part of Agricultural Engineering agencies in this country. Educating the conservative farmers, by demonstration and propaganda in the use of improved implements is absolutely essential for their successful popularisation. To achieve this object there must be a fully developed Agricultural Engineering Extension and Training Organisation in the States and a special co-ordinating guiding set up at the Centre. This Organisation could arrange for planned mass contact and systematic demonstrations in the use of improved agricultural implements with the help of Village Level Workers and other extension staff of the Community Develepment Department. The research work on local agricultural implements should be undertaken in the States. The regional Sub-stations proposed by the Centre should undertake research on a regional basis. The I.C.A.R. would be the appropriate body which should co-relate the research activity of the zonal research sub-stations and guide the Agricultural Engineering Extension Organizations in all the States throughout India.

The programme of Extension Work of improved agricultural implements might present the following difficulties.

1. Lack of knowledge amongst farmers about the working, handling, and repairing of the improved implements.

2. Complicated mechanism of the improved implements.

3. Absence of facilities for repairs and obtaining spare parts in rural areas.

4. High initial prices.

The following suggestions are made to meet these difficulties.

1. Informative literature regarding the various parts, their proper working and handling, repairs, and maintenance should be circulated in the form of pamphlets, and illustrated posters amongst the farmers as well as the field staff. Every new implement should be necessarily accompained by such literature, which should be in the regional languages.

2. Demonstrations of the improved implements should be organised regularly on farmers' lands from time to time to show their proper use and handling.

3. Village craftsmen such as blacksmith and carpenters should be selected and given training in the repair of improved agricultural implements under the technical supervision of a competent Government Agency. Adequate workshop facilities or tools should be made available to these craftsmen to carry out the repairs efficiently and cheaply. Arrangements should also be made to stock spare parts in sufficient numbers for these implements. This latter work could

be conveniently entrusted to village panchayats and co-operative societies wherever they come forward.

Arrangements should be made to make these implements available to the cultivators on hire purchase or outright purchase through the village panchayats and co-operative societies. Medium or short term loans with a low rate of interest should be liberally granted for the purchase of such implements.

In addition to making suitable workshop facilities and tools available to the village craftsmen, it is desirable that State Governments should set up workshops in each district where repair work particularly of an advanced nature could be undertaken. Such workshops could also be utilized as a training centre for village craftsmen.

With a view to bring down the cost of improved implements it is considered necessary that the established manufacturers should be persuaded to undertake their production on a mass scale. They should be encouraged to do so by giving them long term loans for purchasing and installing modern heavy manufacturing machinery and making adequate supply of raw materials available to them freely at controlled prices.

Training facilities should be made available at manufacturing works to technical personnel meant for manning the district workshops.

Manufacturers should also be requested to supply improved implements and spare parts directly to village panchayats and co-operative societies thus eliminating middle man's commission and double handling.

GENERAL STATEMENT ON REPRESENTATIVE TYPES OF

Name of the implement (English and Local)	Name of the District and State	Source of availability	Weight in lb.
Wooden Plough (Nangal)	Osmanabad (Hyderbad)	Vil'age artisans	90-95
Country Plough (Nangal or Langal)	Nowgong (Assam)	do.	22-25
Plough (Langal or Nangal)	Cachar (Assam)	do.	19.5
Plough (Hal)	Tonk (Rajasthan)	do.	48-62
Plough (Hal)	Sikar (Rajasthan)	do.	23-42
Plough (Hal)	Mee ut (Uttar Pradesh)	do.	40
Country Plough (Negilu)	Kolar (Mysore)	do.	25-60
Plough (Langal)	Cuttack (Orissa)	do.	26-35
Country Plough (Hal)	Sheopur and Morena (Madhya Pradesh)	do.	45-55
Wooden Plough (Negalli)	Gulbarga (Hyderbad)	do.	48-68
Country Plough (Nangar)	East Khandesh (Bombay)	do.	112
Country Plough (Nangar)	Poona (Bombay)	do.	60
Country Plough (Nangar)	Ratnagiri (Bombay)	do.	60
Country Plough (Negilu)	South Kanara (Madras)	do.	25-35
Iron Plough (Kalapai)	Tanjore (Madras)	do.	10-20
Plough (Melur Plough)	Madurai (Madras)	do.	18
Plough (Mannargudi Kala-pai)	Tanjore (Madras)	do.	20
Plough (Hal)	Dehra Dun (Uttar Pradesh)	do.	24

DIX II.A

PLOUGHS SHOWING WEIGHT COST OF OPERATION, ETC.

Draft power required to operate it	Cost of the plough in rupees	Area covered in a day in acres	Cost of operation per acre in rupees
2-4 bullocks and 1-2 persons	15/-	1/3	10/-
2 bullocks and 1 person	7/- to 9/-	1/3	12/- to 15/-
1 buffaloe and 1 person	8/-	1/3	12/-
2 bullocks and 1 person	13/- to 15/-	3/4—9/10	4/- to 5/8/-
2 bullocks and 1 person	12/- to 13/-	1	4/-
2 bullocks and 1 person	17/-	4/5—1	8/2/-
2 bullocks and 1 person	4/- to 10/-	1/4—1	6/- to 12/-
2 bullocks and 1 person	10/- to 13/-	2/5—1/2	5/-
2 bullocks and 1 person	10/-	1/2	10/- to 20/-
2 bullocks and 1 person	10/-	1/3—1/2	11/-
2 bullocks and 1 person	20/-	1	3/12/-
2 bullocks and 1 person	20/-	1	5/- to 6/-
2 bullocks and 1 person	12/-	1/4—1	4/-
2 bullocks and 1 person	8/-	1/2	9/-
2 bullocks and 1 person	7/- to 8/-	1/2	9/-
2 bullocks and 1 person	6/8/-	1/2	9/-
2 bullocks and 1 person	9/- to 10/-	1/2	8/-
2 bullocks and 1 person	9/-	1/2	13/-

GENERAL STATEMENT ON REPRESENTATIVE TYPES OF

Name of the implement (English and Local)	Name of the District and State	Source of availability	Weight in lb.
Country Plough (Kalappa)	Trivandrum (Travncore Cochin)	Local artisans	25-40
Plough (Jullundri Hal)	Amritsar (Punjab)	1. S. Natha Singh Chogwan, Amritsar. 2. S. Balwant Singh Fatehabad, Amritsar.	43
Plough (Sialkoti Hal)	Amritsar and Gurdaspur (Punjab)	Village artisans	49
Plough (Deshi Hal)	Karnal, Amritsar Gurdaspur (Punjab)	do.	43
Country Plough (Kalappa)	Trichoor (Travancore-Cochin)	do.	25-40
Country Plough (Kalappa)	Trivandrum (Travancore-Cochin)	do.	22-35
Wetland Plough (Dammu Nagali)	Guntur (Andhra)	do.	30-42
Country Plough (Hal)	Agra (Uttar Pradesh)	do.	40
Duck Footed Plough (Hal)	Raigarh (Madhya Pradesh)	do.	40
Country Plough (Nangar)	East Khandesh (Bombay)	do.	112
Plough (Langal)	Boudh-phulbani (Orissa)	do.	24.5
Plough (Langal)	Bolangir (Orissa)	do.	33
Plough (Hal)	Sheopur (Madhya Pradesh)	do.	48
Plough (Guddala Negilu)	Hassan (Mysore)	do.	30-70
Country Plough (Deshi Hal)	Champaran (Bihar)	do.	25-40

DIX II.A

Ploughs showing Weight, Cost of Operation, etc. *(Concluded)*

Draft power required to operate it	Cost of the plough in rupees	Area covered in a day in acres	Cost of operation per acre in rupees
2 bullocks and 1 person	7/- to 10/-	1/3	—
2 bullocks and 1 person	14/- to 15/-	1	6/-
2 bullocks and 1 person	14/- to 15/-	1	6/-
2 bullocks and 1 person	13/- to 17/-	1	6/-
2 bullocks and 1 person	7/- to 12/-	1/3	—
2 bullocks and 1 person	5/- to 12/-	1/3	—
2 buffaloes and 1 person	7/- to 10/-	1/2	10/-
2 bullocks and 1 person	6/- to 10/-	1/2—1	6/8/- to 8/-
2 bullocks and 1 person	16/-	3/4	7/-
2 bullocks and 1 person	20/-	1	3/12/-
2 bullocks and 1 person	4/-	3/10	5/-
2 bullocks and 1 person	5/-	1/3	4/12/-
2 bullocks and 1 person	9/-	1/2	21/-
2 bullocks and 1 person	6/- to 12/-	1/3	5/- to 7/-
2 bullocks and 1 person	7/- to 13/-	0.26—.4	8/- to 12/-

GENERAL STATEMENT ON REPRESENTATIVE TYPES OF

Name of the implement (English and Local)	Name of the District and State	Weight in lb.	Power required to operate it
Entire Blade Harrow (Rapto)	Amreli (Bombay)	64	2 bullocks and 1 person
Entire Blade Harrow (Ekaliu)	Amreli (Bombay)	47	do.
Entire Blade Harrow (Dhankya)	Jalgaon (Bombay)	75	do.
Entire Blade Harrow (Karale)	Sabar Kantha (Bombay)	40	do.
Entire Blade Harrow (Karale Bakhar)	Broach (Bombay)	70	do.
Harrow (Damala)	Almora (Uttar Pradesh)	16	do.
Harrow (Danyal)	Tehri Garhwal (Uttar Pradesh)	—	do.
Two Blade Harrow (Bodela)	Cuddapah (Andhra)	56	do.
Harrow-cum-Weeder (Bida)	Almost all over West Bengal	45-50	do.
Peg-Tooth Harrow (Bindha)	Nowgong (Assam)	24	do.
Blade Harrow (Bakhar)	Guna (Madhya Bharat)	86	do.
Blade Harrow (Bakhar)	Khargone (Madhya Bharat)	83	do.
Country Harrow (Halube)	Hassan (Mysore)	25-40	do.
Toothed Harrow (Varandi)	South Malabar (Madras)	25	do.
Blade Harrow (Bakhar)	Datia Panna. Shahdol (Vindhya Pradesh)	60	do.
Wetland Harrow (Halube)	Bangalore (Mysore)	30	do.
Harrow (Bida)	Cuttack (Orissa)	46	do.
Hand Harrow (Halube)	Coorg	12	One to two persons
Spike Tooth Harrow (Palli)	Quilon (Travancore-Cochin)	75-85	2 bullocks and 1 person

HARROWS SHOWING WEIGHT, COST, ETC.

Cost (in rupees)	Output per acre per day of 8 hours	Cost of operation per acre	Annual maintenance charges (in rupees)
20/-	2	2/2/-	1/10/-
12/-	2	2/2/-	-/12/-
30/-	5	0/12/-	—
20/-	3	2/8/-	2/4/-
20/-	2	5/-	2/-
10/-	1/2—1	7/-	1/8/-
10/-	1/2—1	8/- to 10/-	1/-
12/-	3.5	—	Nil
15/-	6	-/12/-	1/-
8/- to 10/-	1.5—2	4/- to 5/-	—
17/4/-	2	1/12/-	1/-
15/- to 22/-	1—2	2/- to 3/8/-	1/-
6/-	3	1/8/-	Nil
8/-	2	2/3/-	1/8 to 2/-
10/-	1.5	3/4/-	1/8/-
5/-	4	3/- to 4/-	-/12/- to 1/-
15/-	2	1/8/- to 2/-	1/8/-
1/8/-	1	1/3/-	-/3/-
35/- to 43/-	1/2	10/- to 12/-	2/-

GENERAL STATEMENT ON REPRESENTATIVE TYPES OF

Name of the implement (English and Local)	District and State where used	Weight in lb.	Power required to operate it
Tyned Hoe (Gunti)	Coimbatore (Madras)	15-20	2 bullocks and 2 persons
Tyned Hoe (Eguntae)	Salem (Madras)	20-30	2 bullocks and 1 person
Forked Hoe (Guddali)	Nilgiris (Madras)	3	One labourer
Tyned Hoe (Addagorru)	Chingleput (Madras)	18	2 bullocks and 1 person
Hand Hoe (Kalaikothi)	Malabar (Madras)	10	One person
Tyned Hoe (Chippukunte)	Mandya (Mysore)	15-20	2 bullocks and 1 person
Bladed Hoe (Daora)	Akola (Madhya Pradesh)	28-35	2 bullocks and 1 person
Foot Fork (Lutta Kuta)	Darjeeling (West Bengal)	5.5	One person
Hand Hoe (Nirani or Khurpi)	West Bengal	$\frac{3}{4}$-1	do.
Bladed Hoe (Jod Kolpa)	Khargone (Madhya Bharat)	—	2 bullocks and 2 persons
Bladed Hoe (Kolpe)	Khargone (Madhya Bharat)	—	do.
Pick (Gorhni)	Gorakhpur (Uttar Pradesh)	5.5	One person
Pick (Kodal)	Dehra Dun (Uttar Pradesh)	2	do.
Bladed Hoe (Dante)	Nalgonda (Hyderabad)	50	2 bullocks and 1 person
Entire Blade Hoe (Beli)	Amreli (Bomday)	43	do.
Four-Bladed Hoe (Guntaka)	Kurnool (Andhra)	59	do.
Tyned Hoe (Papattam)	Chingleput (Madras)	25-30	do,

Hoes showing Weight, Cost, Power Required, etc.

Cost (in rupees)	Output in acre per day of 8 hours	Cost of operation per acre	Annual maintenance charges (in rupees)
5/- to 10/-	1.5 —2	2/-	1/- to 1/8/-
7/- to 8/-	1.5 —2	2/-	1/8/- to 2/-
2/-	—	5/- to 7/8/-	-/8/-
8/-	—	1/8/- to 2/-	1/8/- to 2/-
2/-	0.1 —0.15	15/-	-/4/-
4/- to 12/-	1.5 —3	3/4/-	-/8/- to 1/-
6/-	3—4	1/4/-	Nil
12/-	0.02	10/-	1/-
-/12/- to 1/-	0.12—0.25	6/- to 13/-	Nil
15/- to 16/-	4	-/12/- to 1/-	1/-
21/-	4	1/8/-	-/8/-
3/8/-	1.6	9/-	-/8/-
1/-	0.16	10/- to 12/-	-/12/-
10/- to 12/-	1.5 —2	2/- to 2/8/-	—
14/-	3	2/12/-	-/8/-
20/-	5	1/-	Nil
15/-	2—3	1/8/- to 2/-	1/8/-

APPEN

GENERAL STATEMENT ON REPRESENTATIVE TYPES OF

Name of the implement (English and Local)	District and State where used	Weight in lb.	Power required to operate it
Baroda Hoe	Baroda (Bombay)	55	2 bullocks and 1 person
Slit Hoe (Kolpe)	Poona (Bombay)	25	2 bullocks and 2-3 persons
Spade Kodali, Korni	Santhal Pargana (Bihar)	6-8	One person
Bakku	Tekari Gaya (Bihar)	—	do.
Khurpi	Purnea (Bihar)	½-¾	do.
Spade (Kidali)	Ranchi (Bihar)	—	do.

Hoes showing Weight, Cost, Power Required, etc. (*Concluded.*)

Cost (in rupees)	Output in acre per day of 8 hrs.	Cost of operation per acre	Annual maintenance charges (in rupee)
16/- (with out beam)	5	1/4/-	4/-
8/-	4	1/4/-	-/8/-
3/- to 6/-	0.125—0.166	8/- to 10/-	-/4/- to -/8/-
-/8/-	0.1	8/- to 9/-	Nil
-/8/- to -/12/-	1/15 —1/20	10/- to 12/-	Nil
3/- to 3/8/-	0.05 —0.083	12/- to 18/-	-/4/-

Type	Local name	Material used	Power
Single-Row complete drill	Pongrra—Bansa, Nari, Nainhal aur Pore, Nai, Chaurra	Wood, Bamboo, Mild Steel and Sheet Metal	Bullock
Single-Row attachment only	Kottaisal, Pore, Bansa, Bairna Mogha, Alka-Lota, Sadde, Sadigai	Wood, Bamboo, Leather, Bullock Horn, Sheet Metal	Bullock
Two-Row Drills	Duse, Dhuphan, Bithanalu—Gorru, Dofana, Jodannal, Durpan, Moghada, Faidka, Kurgi, Rabi-gorru, Double—Pore— Hal, Phadak, Bevan	Wood, Bamboo, Mild Steel Sheet Metal	do.
Three-Row Drills	Vithulu gorru, Kurigay, Gorru Tarfan, Thaifan Kurgi, Argada, Tissia	do.	do.
Four-Row Drills	Gorru, Korrige, Argada, Naktal-Kurgi, Chawad, Pabhar	do.	do.
Five-Row Drills	Kurgi, Panchotio, Dantal, Panchfani Pabhar	do.	do.
Six-Row Drills	Keni, Gorru, Koorige	do.	do.
Twelve-Row Drills	Gorru, Koorige	Wood and Bamboo	do.

Drills Surveyed

Where used	Weight in lb.	Working capacity	Cost	Life	Annual maintenance cost
Madhya Pradesh and Punjab	40 to 70	1 to 3 acres per day	Rs. 18/- to Rs. 22/- each	3 to 6 years	Rs. 1/- to Rs. 2/-
Bombay, Andhra Pradesh, Madras, Himachal Pradesh, Uttar Pradesh and Mysore	2 to 8	0.6 to 0.75 acre per day	Rs. 1/- to Rs. 4/- each	2 to 4 years	-/4/- to -/8/-
Bombay, Andhra Pradesh, Punjab, Uttar Pradesh and Madhya Pradesh	40 to 70	2 to 4 acres per day	Rs. 15/- to Rs. 30/- each	4 to 10 years	Rs. 1/- to Rs. 5/-
Bombay, Andhra Pradesh, Madras and Madhya Pradesh	30 to 80	2 to 4acres per day	Rs. 10/- to Rs. 35/- each	4 to 10 years	Rs. 2/- to Rs. 5/-
Bombay, Madras, Mysore, and Madhya Pradesh	25 to 80	2.5 to 6 acres per day	Rs. 10/- to Rs 40/- each	3 to 10 years	Rs. 2/- to Rs. 6/-
Bombay State	75 to 80	3 to 4 acres per day	Rs. 30/- to Rs. 82/- each	10 years	Rs. 1/8/- to Rs. 6/-
Bombay, Madras, and Mysore State	26 to 60	3.5 to 5 acres per day	Rs. 25/- to Rs. 35/- each	6 to 10 years	Rs. 2/- to Rs. 3/-
Madras and Mysore State	30 to 35	3 to 6 acres per day	Rs. 18/- to Rs. 30/- each	4 to 6 years	Rs. 1/8/- to Rs. 3/-

GENERAL STATEMENT ON REPRESENTATIVE TYPES OF ROLLERS

Name of the implement (English or Local)	District and State where used	Weight in lb.	Operating power
Threshing Roller (Ronugallu)	Coorg State	800	2 bullocks and 1 person
Double Roller (Hante Machine)	Coorg	232	do.
Stone Roller	Belgaum, Bijapur (Bombay)	1 ton	2 bullocks and 2 person
Roller	Bulandshahr (Uttar Pradesh)	205	2 bullocks and 1 person
Roller (Girari)	Jullundur (Punjab)	533	do.
PLANKS			
Plank-cum-puddler (Chivitee Maram)	South Malabar (Madras)	15	2 bullocks and 1 person
Plank-cum-puddler (Patha)	Jabalpur (Madhya Pradesh)	68	do.
Plank (Katia Pata)	Kanpur (Uttar Pradesh)	80	do.
Plank (Patela)	Barielly (Uttar Pradesh)	80	do.
Plank-cum-leveller (Kopar or Pata or Mai)	Nearly all over Vindhya Pradesh	50—120	4 bullocks and 2 person
Clod Crusher-cum-Plank (Mai)	Darrang (Assam)	17	2 bullocks and 1 person
Wooden ladder (Mai)	Throughout West Bengal except hilly regions	10— 18	do.
Clod Crusher (Mai)	Mayurbhanj (Orissa)	51.5	do.
Plank (Mai)	Sambalpur (Orissa)	35	do.
Plank (Hengi)	Shahabad (Bihar)	80	do.

Planks, Levellers, Ridgers and Harvesting Implements

Cost (in rupees)	Work rate in acre per day	Cost of operation per acre (in rupees)	Annual maintenance cost (in rupees)
35/- to 38/-	3600 lb. to 4000 of crops	10/-	2/8/-
15/- to 20/-	2 acres	3/4/-	2/-
40/-	—	—	Nil
56/-	4 acres	1/10/-	1/4/-
—	4 arces	2/-	Nominal
5/- to 7/-	1 acre	8/- to 9/-	-/8/- to /12/-
4/- to 6/-	4 acres	1/-	-/4/- to 1/-
18/-	4 acres	1/10/-	1/-
10/- to 20/-	4 acres	1/10/-	-/8/-
5/- to 10/-	3-4 acres	1/10/-	1/-
5/-	5½ acres	—	—
2/- to 5/-	1 acre	5/4/-	/4/-
8/- to 9/-	2-3 acres	-/14/- to 1/-	Nil
7/- to 8/-	2.5 acres	1/-	Nil
15/- to 16/-	1 5-2 acres	2/-	-/4/- to -/12/-

General Statement on Representative Types of Rollers

Name of implement (English or Local)	District and State where used	Weight (in lb.)	Operating power
LEVELLERS			
Leveller (Mattada Halage)	Hassan (Mysore)	35	2 bullocks and 1 person
Leveller or Clod crusher (Mai)	Keonjhar (Orissa)	21.5	do.
Leveller or Plank (Palakai)	Tanjore, Trichy, Chingleput (Madras)	20— 30	do.
Leveller (Karah)	Rohtak (Punjab)	40 (All wooden) 80 (All steel)	do.
Leveller (Gnavari or Maram)	Trichur and Trivandrum (Travancore - Cochin)	40— 50	2 bullocks or buffaloes and 1 person
Leveller (Kurree)	Shahdol, Datia (Vindhya Pradesh)	35	2 bullocks and 1 person
Leveller (Votti)	Coimbatore (Madras)	35— 40	do.
Leveller (Urcha Palakai)	South Malabar (Madras)	30— 35	do.
Leveller (Kopar)	Balaghat (Madhya Pradesh)	63	do.
HARVESTING IMPLEMENTS			
Sickle (Daranti)	Dungarpur, Banswara (Rajasthan)	1	1 person
Sickle (Daranti)	Meerut, Gorakhpur (Uttar Pradesh)	0.5—1	do.
Sickle (Palat)	Dehra Dun (Uttar Pradesh)	1.25	do.
Chopper (Balkati)	Meerut (Uttar Pradesh	2	do.

Planks, Levellers, Ridgers and Harvesting Implements (*Contd.*)

Cost (in rupees)	Work rate in acres per day	Cost of operation per acre (in rupees)	Annual maintenance cost (in rupees)
6/-	3 acres	1/8/-	Nil
3/-	2.5 acres	1/-	Nil
10/- to 15/-	1.5-2 acres	3/-	Within a rupee
18/- to 25/-	1 acre	6/-	1/-
25/- to 30/-	0.5 acre	15/- to 18/-	2/- to 3/-
4/- to 8/-	—	3/-	Nil
15/-	1.5 acres	3/- to 4/-	Within a rupee
15/-	1.5 acres	3/-	1.50
10/-	4 acres	1/-	1/- to 1/S/-
1/- to 1.50	0.125 acre	6/- to 7/-	Nil
-/8/- to 1/-	0.125 acre	14/-	-/8/-
1/4/- to 1/-	0.104 acre	15/- to 20/-	1/-
1/8/- to ?/-	0.4 acre	4/-	-/8/-

GENERAL STATEMENT ON REPRESENTATIVE TYPES OF ROLLERS,

Name of implement (English or Local)	District and State where used	Weight (in lb)	Operating power
Sickle (Pat-Kata-Daw)	Throughout West Bengal	1.5	1 person
Chopper (Daw)	All over West Bengal	3	do.
Sugarcane Knife (Aruval)	South Arcot, Coimbatore, Trichy (Madras)	2—3	do.
Crow bar (Thathai)	North Arcot (Madras)	10	do.
Sickle (Aruval)	Coimbatore, Madurai (Madras)	0.5	do.
Sickle (Hasua)	Gaya (Bihar)	0.5—0.75	do.
MaizeSheller (Tekuri)	Santhal Pargana (Bihar)	5/16	do.
RIDGERS			
Ridger (Karha)	Meerut (Uttar Pradesh)	10	2 persons
Ridger (Hath Langal)	All over West Bengal except hilly regions	15	1 person
Ridger	Jabalpur (Madhya Pradesh)	40	2 bullocks and 1 person

DIX II.E

PLANKS, LEVELLERS, RIDGERS AND HARVESTING IMPLEMENTS (*Concluded.*)

Cost (in rupees)	Work rate in acres per day	Cost of operation per acre) (in rupees)	Annual maintenance cost (in rupees)
2/-	0.23	8/12/-	1/-
3/-	0.16	12/8/-	1/-
1/8/- to 2/-	0.05 0.066	18/12/-	-/4/- to -/8/-
2/- to 3/-	0.066 0.083	15/-	-/8/- to 1/-
-/4/- to -/8/-	0.125	8/- to 9/-	Nil
-/4/- to -/8/-	0.125	7/- to 8/-	-/2/-
2/-	40 lb. per day	8/- to 10/- Considering an average yield of 8 md. per acre of maize.	Nil
4/-	—	6/-	1/8/-
5/-	0.5	3/-	Nil
11/- to 16/-	2	2/-	2/- to 2/8/-

DISTRIBUTION AND

(Proprietary and

Size in acres	Area owned		
	Number of holdings	Percentage of holdings	Area (acres)
Andhra Pradesh			
Less than 5	1,767	66.8	3,270
5—10	423	16.8	2,976
10—15	178	6.7	2,168
30—45	50	1.9	1,804
45—60	20	0.8	1,005
Above 60	26	1.0	3,074
Total	2,645	100	18,034
Bombay			
Less than 5	2,446	51.3	5,086
5—10	961	20.2	6,432
10—15	483	10.2	6,001
15—30	568	11.9	11,899
30—45	172	3.6	6,258
45—60	65	1.4	3,327
Above 60	69	1.4	7,710
Total	4,764	100	47,204
Madhya Pradesh			
Less than 5	2,648	59.4	5,076
5—10	842	18.9	5,988
10—15	386	8.7	4,592
15—30	375	8.4	7,965

DIX III

SIZE OF HOLDINGS

Occupancy Holdings)

	Area under personal cultivation			
Percentage of area	Number of holdings	Percentage of holdings	Area (acres)	Percentage of area
18.1	1,674	67.3	3,017	19.1
16.5	396	15.9	2,739	17.3
12.0	166	6.7	1,997	12.6
10.0	45	1.8	1,601	10.1
5.6	17	0.7	868	5.6
17.1	21	0.8	2,199	13.9
100	2,486	100	15,801	100
10.8	2,183	51.0	4,481	11.0
14.7	852	20.2	6,063	14.9
12.7	442	10.3	5,350	13.1
25.2	515	12.2	10,541	25.9
13.3	155	3.6	5,527	13.6
7.0	57	1.3	2,875	7.0
16.3	59	1.4	5,889	14.5
100	4,271	100	40,726	100
13.6	2,553	60.7	4,782	14.6
16.2	779	18.5	5,531	16.9
12.3	344	8.2	4,195	12.8
21.4	350	8.3	7,218	22.1

DISTRIBUTION AND

(Proprietory and

Size in acre		Area owned		
		Number of holdings	Percentage of holdings	Area (acres)
Madhya Pradesh				
	30—45	105	2.4	3,805
	45—60	42	0.9	2,159
Above	60	60	1.3	7,617
Total		4,458	100	37,202
Madras				
Less than	5	3.348	67.6	6,592
	5—10	860	17.4	6,006
	10—15	324	6.5	3,952
	15 - 30	385	5.7	5,853
	30—45	70	1.4	2,553
	45—60	27	0.5	1,399
Above	60	44	0.5	6,194
Total		14,958	100	32,549
Hyderabad				
Less than	5	897	32.0	21,265
	5—10	595	21.3	4,382
	10—15	385	13.8	4,729
	15—30	535	19.1	11,287
	30—45	190	6.8	6,890
	45—60	82	2.9	4,245
Above	60	114	4.1	13.528
Total		2,798	100	47,186

SIZE OF HOLDINGS (*Continued.*)

Occupancy Holdings)

	Area under personal cultivation			
Percentage of area	Number of holdings	Percentage of holdings	Area (acres)	Percentage of area
10.2	94	2.2	3,401	10.4
5.8	37	0.9	1,907	5.8
20.5	49	1.2	5,705	17.4
100	4,206	100	32,739	100
20.3	3,219	68.4	6,316	22.1
18.5	808	17.2	5,636	19.8
12.1	301	6.4	3,664	12.8
18.0	260	5.5	5,269	18.5
7.8	61	1.3	2,205	7.7
4.3	23	0.5	1,159	4.1
19.0	31	0.7	4,284	15.0
100	4,703	100	28,533	100
4.5	844	33.8	1,985	5.1
9.3	528	21.1	3,895	10.0
10.3	336	13.5	4,139	10.6
23.9	464	18.6	9,791	25.0
14.6	163	6.5	5,908	15.1
9.0	70	2.8	3,603	9.2
28.6	92	3.7	9,777	25.0
100	2,494	100	39,098	100

APPEN

DISTRIBUTION AND

(Proprietary and

Size in acres	Area owned		
	Number of holdings	Percentage of holdings	Area (acres)
Madhya Bharat			
Less than 5	652	45.6	1,414
5—10	323	22.6	2,3 5
10—15	173	12.1	2,124
15—30	193	13.5	4,004
30—45	51	3.5	1,831
45—60	18	1.3	921
Above 60	19	1.4	2,024
Total	1,429	100	14,643
Bhopal			
Less than 5	39	31.7	62
5—10	23	18.7	174
10—15	17	13.8	212
15—30	25	20.3	522
30—45	9	7.3	321
45—60	4	3.3	194
Above 60	6	4.9	770
Total	123	100	2,255
Punjab			
10—15	121	—	1,515
15—30	131	—	2,743
30—45	38	—	1,378

SIZE OF HOLDINGS (*Continued.*)

Occupancy Holdings)

	Area under personal cultivation			
Percentage of area	Number of holdings	Percentage of holdings	Area (acres)	Percentage of acres
9.6	627	46.4	1,352	10,3
16.0	307	22.7	2,202	16.7
14.5	162	12.0	1,987	15.1
27.3	179	13.2	3,699	28.0
12 5	45	3.3	1,628	12.3
6.3	16	1.2	799	6.1
13.8	16	1.2	1,516	11.5
100	1,322	100	13,183	100
2.7	37	31.9	60	3.0
7.7	23	19.8	165	8.2
9.4	16	13.8	200	9.9
23.2	24	20.7	494	24.4
14.2	8	6.9	296	14.6
8.6	3	2.6	178	8.8
34.2	5	4.3	630	31.1
100	116	100	2,023	100
—	101	—	1,246	—
—	104	—	2,146	—
—	27	—	975	—

DISTRIBUTION AND

(Proprietory and

Size in acres		Area owned		
		Number of holdings	Percentage of holdings	Area (acres)
Punjab				
	45—60	15	—	758
Above	60	19	—	2,301
Total		324	—	8,694
Mysore				
	10—15	86	—	1,039
	15—30	84	—	1,736
	30—45	22	—	772
	45—60	8	—	412
Above	60	10	—	1,085
Total		210	—	5,044
Pepsu				
	10—15	63	—	788
	15—30	64	—	1,321
	30—45	16	—	587
	4 —60	6	—	288
Above	60	6	—	616
Total		155	—	3,600
Delhi				
	10—15	3	—	33
	15—30	2	—	37

Size of Holdings (*Continued*)

Occupancy Holdings)

	Area under personal cultivation			
Percentage of area	Number of holdings	Percentage of holdings	Area (Acres)	Percentage of area
—	10	—	485	—
—	10	—	990	—
—	252	—	5,842	—
—	81	—	967	—
—	79	—	1,601	—
—	19	—	699	—
—	1	—	362	—
—	4	—	864	—
—	194	—	4,499	—
—	51	—	643	—
—	54	—	1,108	—
—	13	—	462	—
—	7	—	223	—
—	8	—	3[illegible]3	—
—	126	—	2,799	—
—	3	—	33	—
—	2	—	36	—

DISTRIBUTION AND

(Proprietary and

Size in acres	Area owned		
	Number of holdings	Percentage of holdings	Area (Acres)
Delhi			
30—45	—	—	11
45—60	—	—	3
Above 60	—	—	6
Total	5	—	90
Himachal Pradesh			
10—15	6	—	67
15—30	3	—	65
30—45	1	—	14
45—60	—	—	5
Above 60	—	—	17
Total	10	—	168
Vindhya Pradesh			
10—15	51	—	631
15—30	64	—	1,343
30—45	19	—	690
45—60	8	—	383
Above 60	9	—	968
Total	151	—	4,015
Coorg			
10—15	1	—	9
15—30	1	—	23

Size of Holdings (*Continued*)

Occupancy Holdings)

Percentage of area	Area under personal cultivation			
	Number of holdings	Percentage of holdings	Area (Acres)	Percentage of area
—	—	—	9	—
—	—	—	3	—
—	—	—	6	—
—	5	—	87	—
—	5	—	65	—
—	3	—	61	—
—	1	—	13	—
—	—	—	5	—
—	—	—	16	—
—	9	—	160	—
—	50	—	616	—
—	23	—	1,296	—
—	18	—	657	—
—	7	—	361	—
—	8	—	854	—
—	146	—	3,784	—
—	1	—	8	—
—	1	—	21	—

Area in acres	Area owned		
	Number of holdings	Percentage of holdings	Area (Acres)
Coorg			
30—45	—	—	12
45—60	—	—	9
Above 60	—	—	74
Total	2	—	127
Rajasthan			
Less than 5	84	51.4	172
5—10	34	20.9	244
10—15	16	10.1	200
15—30	18	11.4	382
30—45	6	3.4	198
45—60	2	1.3	107
Above 60	3	1.5	260
Total	163	102	1,563
Travancore-Cochin			
Less than 5	2,165	94.9	1,897
5—10	80	3.5	541
10—25	30	1.3	432
25—40	4	0.2	126
Above 40	3	0.1	327
Total	2,282	100	3,323

SIZE OF HOLDINGS (*Continued*)

Occupancy Holdings)

	Area under personal cultivation			
Percentage of area	Number of holdings	Percentage of holdings	Area (Acres)	Percentage of area
—	—	—	39	—
—	—	—	7	—
—	—	—	70	—
—	2	—	116	—
11.0	77	52.5	163	12.7
15.7	32	21.5	228	17.7
12.8	15	10.0	181	14.1
24.4	16	10.9	332	25.8
12.6	4	2.9	157	12.3
6.8	2	1.1	81	6.3
16.7	2	1.1	142	11.1
100	148	100	1,284	100
57.1	—	—	—	—
16.3	—	—	—	—
13.0	—	—	—	—
3.8	—	—	—	
9.8	—	—	—	—
100	—	—	—	—

APPENDIX IV

TERMINOLOGY

Indigenous Implement. An implement which is traditionally of Indian origin and has been in use in Indian agriculture.

Plough. Plough is a preparatory tillage implement used for initial opening up the soil and loosening it in order to facilitate subsequent operations for seed bed preparations.

Body. The body is the main part of the plough to which the shoe, beam and handle are generally attached.

Shoe. The shoe is that part of the indigenous plough which supports and stabilizes it at the required depth and further opens up the soil and breaks it up.

Share. The share is working part of the plough attached to the shoe which first penetrates into the soil.

Beam or Shaft or Pole. A long wooden piece connected to the body of an implement to which the yoke is attached directly.

Handle. A wooden piece attached vertically to the body to enable the farmer to control the plough.

Grip. Grip is a small wooden piece attached near the top of the handle for convenience of handling.

Hitch. Hitch is a group of parts to transmit the pull from the animals to the implements.

Harrow. Harrow is a secondary tillage implement employed after the initial ploughing for obtaining the proper tilth.

Head Piece. The head piece of a harrow is a heavy wooden piece or block to which the tynes or blades are attached. The beam and the handle also have their ends fixed to this part.

Prongs. These are short wooden or iron-projecting parts attached to the head piece and carry the ends of the blade in a blade harrow. (i.e. Guntaka or Bakhar).

Blade. An iron part of suitable shape which forms the cutting part of an implement.

Tynes or Pegs. These are working points of the harrows attached to the head piece and are made either of wood, iron or steel.

Blade Harrow. It consists of a wooden frame with a flat hori zontal iron blade.

Tyned Harrow. It is a harrow with vertical prong or tynes.

Peg Tooth Harrow. It is a harrow with a series of vertical mounted steel or hard wooden pegs or point.

Plank. Plank is a wooden board provided usually with a shaft handle and rings for yoking animals. It is used for covering the seeds, breaking the clods and compacting tho seed-bed or levelling puddled lands.

Clod Crusher. A dressed heavy wooden beam or a pair of beams connected together with iron or steel rings which is hitched behind animals and dragged over ploughed lands for crushing clods.

Ridger. Ridger is an implement which is used to form ridges on ploughed and harrowed land.

Puddler. Puddler is an implement specifically designed for puddling land with standing water for the cultivation of wet crops.

Seed Drill. Seed drill is an implement which is used for sowing seeds in rows.

Furrow Opener (or Tyne). A device or contrivance for opening furrows in prepared land into which seeds are dropped.

Seed-Bowl. Seed Bowl is a receptacle to which the seed tubes in a seed drill are attached and into which the seeds are manually fed in regulated quantities.

Seed Tubes. Tubes which convey the seed from the seed bowl to the furrow.

Cultivator. A general purpose soil stirring implement used for weed removal and breaking surface crust for seed bed preparation.

Hoe. A manually-operated or animal-drawn implement used in intercultural operations.

Single Handed Hoe. A manually operated hoe which is worked with one hand, e.g. Khurpi.

Double Handed Hoe. A manually operated hoe worked with two hands, e.g. spade.

Kharif Season. The period between May/June to october/ November.

Rabi Season. The period between September/October to March/ April.

Zaid Season. The period from April/May to June/July.

Wet Cultivation. Wet cultivation is the practice of carrying out the field operations in standing water.

Dry Farming. Dry farming is the practice of cultivation under conditions of deficient rainfall.

APPENDIX V

VERNACULAR NOMENCLATURE OF AGRICULTURAL IMPLEMENTS

English	*Hindi*	*Vernacular*
Country Plough	Desi Hal	Nagar (Marathi), Kalapai, Negilu (Madra) Kalappa (Travancore Cochin) Nagalli (Hyderabad), Nangal (Assam), Langal Orissa, Bengal & Assam).
Blade Harrow	Bakhar	Karale, Dhankya, Ekaliu, Rapto (Bombay), Gunta.a (Hyderabad and Madras),
Spade	Kodali	Korni (Bihar), Kassi (Punjab), Mummuty (Madras), Phaora (Uttar Pradesh Kodi (Orissa), Kahi (Punjab).
Hand Hoe	Khurpi	Nirani (West Bengal), Rambha (Punjab & Orissa). Kalai Kothi (Madras).
Slit Hoe	Kolpe	Kolpe, Dora (Bombay), Meesalu.
Pick	Kodal	Gorhni, Kasai (Uttar Pradesh.)
Entire Blade Hoe	Bakhar	Beli (Bombay), Kolpa (Madhya Bharat), Daora (Madhya Pradesh), Guntaka (Andhra & Madras), Dante (Hyderabad).
Foot Fork	...	Lutta Kuta (West Bengal).
Tyned Hoe	...	Pappattam (Madras), Chippukunte. (Mysore), Addagorru, Eguntae, Gunti (Madras).
Forked Hoe	...	Guddali (Madras).
Plank	Patela	Sanwar, Meda, Mej (Rajasthan), Sohaga (Punjab, Rajasthan, Himachal Pradesh), Henga and Hengi (Bihar), Pata, Moi, Mera, Jhinidar (Uttar Pra-

		desh) Patha, Mahi, Kopar, Pathal (Madhya Pradesh, Mahi (Himachal Pradesh and Madhya Pradesh), Palakai (Madras) Maram (Travancore-Cochin), Mai (Orissa and West Bengal).
Roller	...	Oudh (Himachal Pradesh), Girari (Punjab)
Ridger	...	Sorra Negalli, Wadduha Kuna, Mandikay, Haligaly (Hyderabad) Palagai (Madras), Hath Langal, Sorn (West Bengal).
Leveller	Kopar	Henga (Bihar), Thave (Coorg), Karah, gori (Punjab), Nirathu Palagai, Vothi, Parasu, Parambhu (Madras), Ganavari Maram (Travancore-Cochin) Rahsee, Kean, Kurri, (Vindhya Pradesh), Korad (Orissa).
Puddler	...	Mach (Punjab), Chivittu Maram (Madras).
Sickle	Darati	Hansia, Dantali, Hasia, Drant (Rajasthan), Husua, Kachia (Bihar), Vila, Datardu (Bombay), Koi, Kathi, Kodulu (Coorg), Kachi (Assam), Dali (Himachal Pradesh) Aruval (Madras) Daa, (Orissa and West Bengal), Kaste, Kanchi (West Bengal).
Hand Chopper	Gandasa	Balkati (Uttar Pradesh), Toka (Punjab), Daw (Assam).
Single-row Seed Drill	Bansa	Bairna (Uttar Pradesh) Mogha (Bombay) Alka-Lota, Kursa Lota, (Andhra Pradesh), Sadagai (Madras), Pore (Punjab and Himachal Pradesh), Saddle (Mysore) Nari, Nai, (Madhya Pradesh).
Two-row Seed Drill	Dhuphan or Dofana	Moghada, Faidko, Kurgi (Bombay), Vithanalu Gorru (Andhra Madras), Double Pore Hal (Punjab), Durpan, Phadak, Bevan, (Madhya Pradesh).

Three-row Seed Drill	Trifan	Vithulu Gorru (Andhra Pradesh), Gorru, (Madras), Tiffan, Argada, Tissia (Madhya Pradesh).
Four-row Seed Drill	Argada	Chawad, Pabhar, Naktal, (Bombay), Gorru (Madras), Korrige (Mysore)
Five-row Seed Drill	Panchfani	Dantal, Pabhar, Kurgi, Panchotio (Bombay) Gorru (Madras)
Six-row Seed Drill	...	Keni (Bombay), Gorru (Madras), Koorige (Mysore).
Twelve-row Seed Drill	...	Gorru (Madras), Koorige (Mysore).

APPENDIX VI

INDEX OF VERNACULAR AND SCIENTIFIC NAMES OF COMMON WOOD

The following statement gives the scientific, trade and vernacular names of the common woods which have been reported to be used in the construction of different parts of the indigenous agricultural implements and tools.

Trade Name	*Scientific Name*	*Other Vernacular Names*
Babul	Acacia Arabica	Babul, Kikar, Gobli, babur, Kuruval etc.
Mango	Magnifera Indica	Am, Amba; Mavoo (Coorg)
Sandan	Ougeinia Dalbergioides	Bandhan Panjan (Bihar) Tinsa (Central Province)
Benteak	Lagerstroemia Lanceolata	Nana (Bombay), Nandi (Coorg), Venteak (Tamil)
Baing	Tetrameles Nudiflora	Bhelu (Assam), Maina Kat (Bengal), Pantham Cheeni
Rcsewood or Bombay blackwood	Dalbergia Latifolia	Biti (Coorg) Veeti (Mal) Satistal (Bengal), Sitsal (Bihar), Shisham (Bombay)
Shisham	Dalbergia Sissoo	Tali (Bihar Punjab)
Chir	P. Longifolia	Kail, Partal
Deodar	Cedrus Deodara	Paludar, Diar, Devidar
Axle wood	Anogeissus Latifolia	Chakwa (Bengal), Dhawa, Dhau Dhaura, Vekkali.
Bijasal	Petrocarpus Marsupium	Paisal (Bihar), Vengai (Tamil), Honne (Coorg)
Indian Chestnut	Castanopsis hystrix	Katus, Kingori (Assam).
Jack	Artocarpus Integrifolia	Sam, hebalsu, Bharas (Bengal) halasu (Coorg)
Jaman	Eugenia Species	Nir Naval, Neralu (Coorg), Jamun.
Ebony	Diospyros species	Tendu, Kendu (Bihar) Korunkali.

Mulberry	Moras species	Tut, Tutri
Teak	Tectona Grandis	Sagun, Sagwan, (Bihar) Tekku (Tamil)
Laurel	Terminalia tementosa	Asna, Sain, Asan, Sajar (Central) Province), Saj
Sal	Shorea robusta	Sal
Kendi	Lagerstroemia Parviflora	Nandi, Sidak, Dauri, Sidha (Bihar).
Pali	Dichopsis Species	Pali, Tali

APPENDIX VII

LIST OF REFERENCES

1. Indian Agricultural Atlas—*Issued by* the Economic and Statistical Advisor, Ministry of Food and Agriculture.

2. Survey of Indigenous Implements of Bombay Presidency *by* Rao Sahib Kelkar.

3. Agriculture in Ancient India *by* Gangopadhyaya

4. Agriculture in Ancient India *by* S.P. Raychaudhari

5. Commercial Timbers of India *by* H. Trotter

6. Farm Machinery Notes *by* Mason Vaugh

7. A Brief Agricultural Geography of West Bengal

8. Common Cultivated Crops of South India *by* V.T. Subbiah Mudaliar

9. A Preliminary Study of Farm Implements used in Taiwan Province *by* Fengchow C. Ma, T. Takasaka, and Ching-Wen Yang

10. India 1957—A Reference Manual—*Compiled by* Research and Reference Division, Ministry of Information and Broadcasting.